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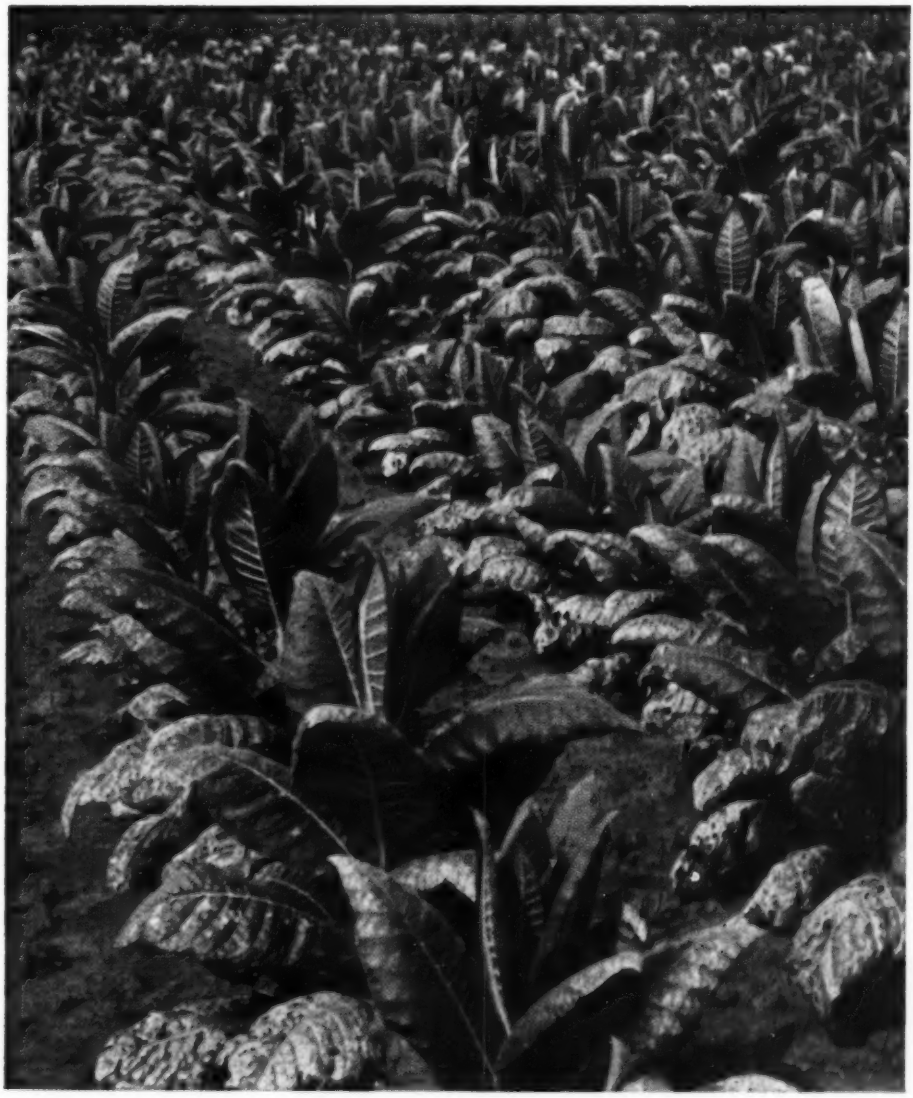

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Better Crops with PLANT FOOD

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIX NO. 8

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A Red Ear in This Shock?

Better Crops with PLANT FOOD

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VOL. XXXIX WASHINGTON, D. C., OCTOBER 1955 No. 8

Let's Travel Again . . .

Remembered Roads

Jeff McDermid

(ELWOOD R. MCINTYRE)

TIME enough for closely seen, intimate views of rural landscapes from public roads is rare in these days of sudden departure and quick arrival. What in former times were memorable and well-known landmarks of local content and pride in that past age of leisurely journeying are now a mere blur of quickly vanished vistas, passing before the confused eyes like the too swift unreeling of a speedy film. Moreover, the wide concrete double pavements that extend the artificial city with its unvarying monotony into the green and arboreal countryside rob us of something which mere convenience cannot replace.

No longer does the hub of one's quiet old vehicle brush the edges of flower-bordered lanes or come close to the wild thickets and stately cathedral aisles of the open forest, in whose vernal depths we could see the brown carpets of leaf mold and the flecks of sunshine dipping through the leaves to form a fairyland of shadowy purple pathways we often longed to follow. Today such scenes come only to the hiker and the cyclist who are devotees of some science or cult that can spare the time for the wildwood's beckoning charms. For the rest of us it means only the ten minutes it takes to ride from one gas station to the next hamlet with a good barbecue stand or tavern showing baseball TV programs. We thus barter the joys that live forever for the passing whimsey that feeds our discontent.

At the other tragic extreme, certain places in the nation's highways associated with sanguinary conflicts and heroic deaths were almost non-existent

in our own home bailiwick. Such spots of notable carnage with their bronze tablets and marble markers were so infrequent that people went on long excursions to see them. We gazed in awe and sorrow at such areas of strife and violence, usually located in some park-like rural nook with anything but a sense of doom about it.

Thus we paused at the sunken road near Marye's Hill at Fredericksburg, the winding Hagerstown road at Antietam, the rail-fenced lanes that thread across the valley at the foot of Big and Little Round Tops en route to Cashtown and Emmettsburg, the thin woods road near Pittsburg Landing, or the narrow Orange Plant Road in the Virginia Wilderness.

NOT so today. In the wake of our deliberate desire to quit one place in an instant and reach our destination in the next one, we scatter the seeds of calamity and crimson disaster from one end of our fair country to the other. Hence we now have an "X" to mark the spot where sudden ends came to the lives and happiness of well-meaning people, and at a rate far beyond the fatalities which have been sanctioned by official wars.

No longer need we buzz long distances to pause beside the blood-soaked soil of human sacrifice. Between your town and mine and in almost everybody's vicinity we come to these unheeded reminders of mass murder induced by the mechanical mania which holds us in an ever-tighter grip. But just as we miss most of the beauty and thrill of country hillsides by rapid motion through them, so do we escape a sense of caution from the unpleasant things which have happened there.

But it's nicer to resume remembrances of some old impressions received on various slow highways of our youth—which sometimes does not seem so long ago. No doubt you likewise carry with you similar memories of quiet rambles on familiar roads.

ONE such impression has to do with the first glimpse I had as a sand country fellow raised near spindling rye fields of the bounty caused by rich prairie soils in southeastern Minnesota. Paying a brief visit to a kind relative near Spring Valley, I roamed out beyond the town's boundaries into a fertile valley where shocks of newly harvested wheat were waiting in the sunshine for the stackers.

Whether it was caused by my own unaccustomed vision, the condition of the atmosphere, or the native abundance of the land, I shall never know. But the vivid golden hues of those heavy shocks of wheat bending slightly at the tops like the Biblical dream of the king remain with me still. It was so vibrant and colorful in contrast to the dark green foliage and the dusty weed growth on the borders. That field of golden grain shimmering there in the silence of a brilliant summer afternoon in the heyday of my youth has always been a master color chart to me. I use it to judge my acceptance of harvest paintings in many galleries where the canvasses of masters attempt to capture the indescribable glories of the growing season's zenith hour.

Sharply at variance with the bounteous bypath just described, is a prairie road on the high plateau of the Dakota country, where Paha Sapa looks eastward from the Black Hill range. In brown and sober tones, with racing tumbleweeds chased by a warm Chinook, there was a certain unfinished dirt highway that led from a raw new claim-dweller's town to the yellowish pine shack perched in a kind of willing loneliness where our folks were living through their preemption period. As one walked or rode horseback along that often barely descernible trail, the wild Herefords would range close to their insulting barbwire fence and stare in grim curiosity at us eastern tenderfeet.

The chirping meadowlarks accompanied us in more friendly fashion, and the teeming denizens of dog-town bur-

rows chattered wildly and hoisted themselves on nervous hind legs to see that we paid them no unwanted visit. I presume I remember that road because of the newness of it all, the great change in our lives and customs in adjusting to this vast cloud-touched high plains country after 20 years spent in

the muggy flats of a land only 500 feet above sea level.

There as one came home of a dusky evening—just as it did back in the old home—a tiny yellow beacon burned steadily in the small window of the shack. This was ample testimony that all was well and Mother was waiting, probably with some bacon and eggs ready and a dessert of tapioca or jello from that imported box of mail-order groceries.

WHAT would life be, how long would memories remain, how lasting would be our gratitude and reverence were there no mothers and wives and other friends always lighting the lamps to keep the home-bound fellow swift and eager on his course? And then when the time arrives when welcoming home lights are seldom shining, and those who lighted them for you are in a Land that needs no guiding beacons evermore, then we often know what it is to stumble and grope our way alone. Yet after all, it is really comforting, as St. Paul reminds us, to recall things that are lovely and of good repute and then to "think on these things."

When my grandparents and their associates crowded the simple Winnebagoes and Chippewas from the garden spots of my state and forced them into the light sand country of short grass and small potatoes, they hardly thought to do them a favor. But as far as natural beauty and roadside charm are concerned, that poor lean sand country of the Midlands has turned out pretty well. All summer long it is decked with garlands and bathed in color, possibly some of the extracts of those tall weeds serving the aborigines with both paint and medicine.

Some of the land lies close to reed-grown streams and lakes, and the wild fowl and fish are still abundant. Better yet, the lore of modern agriculture has improved the productivity of the land and still left untouched those acres of marsh and hill which are the never-failing source of seasonal beauty and incredible profusion of bloom.

Then, on the south bank of the Wisconsin river runs another familiar country road between two thriving villages. Here the gravel knolls dip straight down to the sluggish inlets of the wide stream, and nature has taken over without much protest. Many a time our family drove slowly along this sandy road, always stopping in a little grove with a small cellar ruin and some lilac bushes in it. It was there that my grandfather built his frame house in the late 1840's, and where he raised a family that somehow never forgot their privilege of being one with a departed generation of primitive pioneers. All that they lacked in comfort or success

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Fig. 1. Here on the Clark County Hospital farm at Owen, Wisconsin, Professor Emil Truog (left) and Calvin Mills, Superintendent of the farm, display alfalfa-brome on a field that was given "the treatment"—5 tons of grade A lime (½ disced in before plowing, the balance applied to plowed land and worked into the surface 4 inches) plus 1,000 lbs. of 10-10-10 fertilizer per acre. This field continued to produce good crops of alfalfa-brome over a period of 5 years.

Fertilizers Will Cut Production Costs

By C. J. Chapman

Soils Department, University of Wisconsin, Madison, Wisconsin

WISCONSIN farmers in 1954 used a total of 433,713 tons of commercial fertilizer. This is better than 10 times the tonnage used in 1939, but we are still going in the red on our soil-bank balances. Recent studies show that Wisconsin farmers should be using a million tons of approximately a 4-10-20 grade a year in order to break even on their soil fertility budget. This is twice as much fertilizer as our farmers are currently using.

Why will it pay to double the present rate of application of fertilizers? This question can now be answered with the results of fertilizer trials carried out over a period of many years where comparisons were made of the conventional low-potash grades, with double rate treatment of both low- and high-potash mixtures. In Table I are the averages of all fertilizer demonstrations carried out in some 50 Wisconsin counties over a period of seven years. These yield data indicate that it will pay to increase the rate of application of fertilizer from the conventional 250 pounds to 500 or more pounds per acre on average farms. The yield data show

TABLE I.—AVERAGE YIELDS FOR ALL PLOTS WHERE THE CONVENTIONAL APPLICATION (250 LBS.) WAS COMPARED WITH THE DOUBLE RATE (500 LBS.) AND WHERE THE RESIDUAL CARRY-OVER BENEFIT TO THE HAY CROP WAS CHECKED, ALSO A COMPARISON OF 0-20-0 OR 0-20-20 WITH 0-10-30.

Treatment	Average[1] yield grain	Average yield straw	Value of increase grain & straw	Average yield hay	Pounds increase hay	Value of[2] inc. grain straw & hay	Cost of fertilizer	Net profit per acre
250# 0–20–0 (or 0–20–20)	60.9 bu.	2625#	$12.63	6199#	1022	$27.96	$ 7.86	$20.10
500# 0–20–0 (or 0–20–20)	66.4	2827	17.71	6822	1645	42.35	13.36	29.02
250# 0–20–20 (or 0–10–30)	66.8	2748	17.73	6986	1809	44.85	9.51	35.80
500# 0–20–20 (or 0–10–30)	66.6	2836	17.81	7874	2697	58.26	17.07	41.21
No fertilizer	49.5	1991		5177				

1. Includes plots both with and without nitrogen.
2. Grain figured at 85 cents per bushel—straw at $8 per ton—hay at $30 per ton.

further that the highest net profit is attained from the double rate high-potash treatment, and is outstanding when the residual carry-over benefit to the hay crop is added to the value of the grain and straw increases the first year.

Nitrogen Use Increases

During the past 4 or 5 years, we have witnessed an almost phenomenal growth in the use of nitrogen fertilizer by farmers in this country. Factory capacity for the production of synthetic nitrogen fertilizer is keeping ahead of this rapidly expanding market. Not only have all of the old 9 gunpowder munition plants been converted for the production of synthetic nitrogen fertilizer, but a total of some 46 additional factories have been or are in the process of being built in this country, which by 1957 will give us an estimated capacity of over 4 million tons of fixed nitrogen.

Ammonium nitrate as a source of low-cost nitrogen has come into wide use for corn, grain, pastures, and many other crops. In fact, the demand some 3 or 4 years ago so greatly exceeded the supply that farmers turned to another source of low-cost nitrogen—anhydrous ammonia. This liquefied form of ammonia gas (NH_3) carries 82½% nitrogen. It must be held in rust-resisting steel tanks under a pressure ranging from 100 to 200 pounds per square inch. The application of this liquid gas calls for special types of applicators which inject or "knife" it into the soil where it is "fixed" and held until the soil warms up to temperatures of about 50° or above. It then nitrifies and becomes available to growing crops. At temperatures below 50° it is held in the soil until growing conditions convert it into available forms.

In the year 1952, there were just two custom applicators for anhydrous ammonia operating in Wisconsin. By 1955, the number had increased to nearly 400. The growth of the anhydrous business in other states has been even more spectacular. In Missouri, Kansas, Nebraska, Iowa, southern Minnesota—in fact, in all of the corn states of the Midwest—we have witnessed this unprecedented interest

in and use of anhydrous ammonia. Because of its high concentration and low unit cost, it has become one of the chief sources of nitrogen for direct application.

There will continue to be a market for solid forms of nitrogen, such as ammonium nitrate, urea, ammonium sulfate, sodium and calcium nitrates, and cyanamid, and for the non-volatile or low-pressure solutions such as N-32, N-41, etc. There are conditions where anhydrous ammonia cannot be used for direct application; however, new and specially designed equipment being built for its application is adapting it to a wider range of conditions.

Low-pressure or non-volatile nitrogen solutions as well as liquid forms of high-nitrogen mixed fertilizer containing phosphate or phosphate-potash are likewise finding a wider and wider market and are coming into quite general use. Ease of application with the large 40-foot boom spray equipment or the low-pressure inexpensive tanks mounted on tractors is a factor in favor of these non-volatile or low-pressure liquid forms of straight nitrogen or mixed fertilizers.

Yes, it does appear that we are now entering upon "the great nitrogen era" that is capable of bringing about greater abundance in life and living on American farms.

Increases Need for Minerals

But this gigantic expansion in the use of nitrogen fertilizer is accentuating more and more everyday the need for more minerals in our soil. We must, all of us, as never before stress the importance of lime, phosphate, and potash. In fact, there will be an increasing need for certain of the trace and secondary minerals in order to balance out fertility. The manufacturers of nitrogen fertilizer, whether it be the solid or liquid forms, must work together with the manufacturers and distributors supplying phosphate, potash, trace, and secondary minerals and encourage farmers to use these minerals for balanced fertility. We must also apply lime and maintain our soils at the proper reaction—otherwise we are headed for trouble.

Nitrogen for Small Grain?

What about the use of nitrogen for small grain? Yield data shown in Table II tell that story. Actually, it was the nitrogen applied to our demonstrational grain plots that made possible the full utilization of treatment with phosphate and potash. Liberal treatment with phosphate-potash (and lime where needed) helps to establish legume seedings which in turn will withstand more competition with the ranker growth of straw induced by

TABLE II.—AVERAGE YIELDS FOR ALL GRAIN PLOTS (MOSTLY OATS)—1945 TO 1954 WHERE A COMPARISON WAS MADE OF 0-20-0 OR 0-20-20 WITH 0-10-30 WITH AND WITHOUT NITROGEN. (AMMONIUM NITRATE APPLIED AS A TOPDRESSING).

Treatment (average for all plots) (Mostly oats, some barley & wheat)	Yield per acre grain	Yield per acre straw	Bushels increase grain	Pounds increase straw	Value of increase grain & straw	Cost of fertilizer	Net profit per acre
350# of 0–20–0, 0–20–20, 0–10–30	56.3 bu.	2505	9.7	419	$ 9.92	$ 9.35	$ .57
350# of 0–20–0, 0–20–20, 0–10–30 plus 100# ammonium nitrate	65.4	3191	18.8	1105	20.40	13.85	6.55
No fertilizer	46.6	2086					

Fig. 2. A sidedressing of 60 lbs. of anhydrous ammonia at the knee-high stage resulted in an increase of 42 bu. of corn per acre. This increase on the 60 acres grown by Robert Devine, Oregon, Wisconsin, gave him an extra 2,520 bu. which at $1.60 per bu. had a value of $4,032. The anhydrous ammonia at $8 per acre cost him $480, leaving a net profit of $3,552. The feeding value of the nitrogen-treated corn was enriched; could easily have run 2% higher in its content of crude protein.

applications of nitrogen. But nitrogen will increase the danger of lodging of grain, and for that reason, care must be exercised in it's use. There are, notwithstanding, thousands and thousands of acres of thin poor soil in Wisconsin where the lack of nitrogen is more responsible for poor yields of grain than is the lack of any other element. Thus, in order to attain the highest production of grain on such soils, it has been found highly profitable to supplement phosphate-potash mixtures with nitrogen.

Rye and winter wheat often respond with great profit to treatment with topdress applications of nitrogen (100 to 150 pounds ammonium nitrate, 75 to 100 pounds urea, or 40 to 45 pounds of anhydrous ammonia). For spring-seeded grain, oats or barley, extra nitrogen (solid forms) may be applied as a topdressing after the grain has been seeded. (Better to apply anhydrous ammonia or the liquid forms of nitrogen as a "preplant" in advance of seeding.)

Acidifying Effect Negligible

The great increase in the use of nitrogen fertilizers in recent years has led some authorities to point out with some concern that most of these carriers of nitrogen acidify the soil. However, this is a negligible factor even though it's true that anhydrous ammonia, in fact all ammonium salts as well as certain other carriers of nitrogen, do increase acidity somewhat. In their bulletin No. 482 entitled "Anhydrous Ammonia as a Source of Nitrogen," W. B. Andrews, J. A. Neely, and F. E. Edwards of the Mississippi Agricultural Experiment Station make the following comments on this factor of soil acidity or alkalinity resulting from the application of different nitrogen fertilizers. "Anhydrous ammonia, ammonium nitrate, and uramon have a slightly acid effect on the soil. In order to maintain the lime content of the soil where these sources of nitrogen are used, it is necessary to apply some lime to the soil periodically. The cost

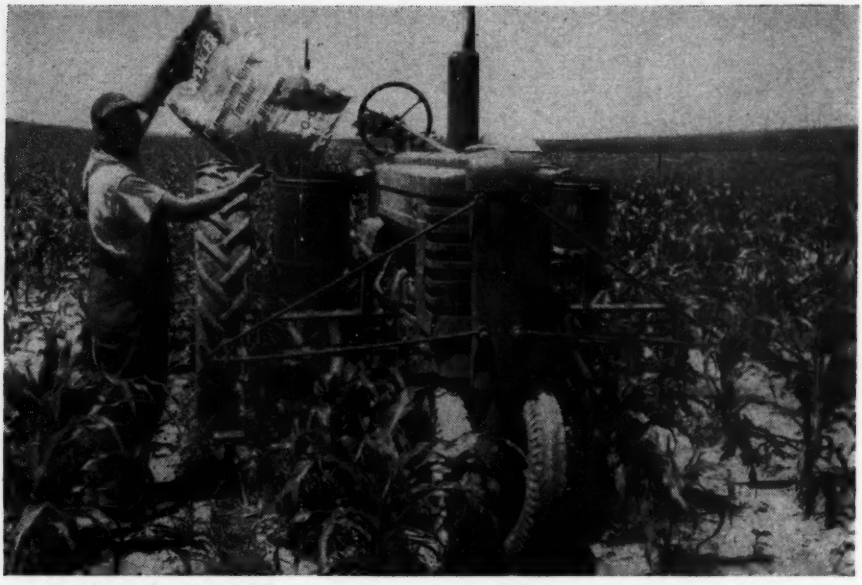

Fig. 3. All makes of tractors can be equipped with attachments for the application of either solid or liquid fertilizer. This farmer is sidedressing corn at the knee-high stage with ammonium nitrate. Other sources of nitrogen fertilizer suitable for sidedressing are ammonium sulfate (21% nitrogen), urea (45% nitrogen), calcium or sodium nitrate (16% nitrogen). On low fertility land some farmers sidedress with 10-10-10 or 12-12-12.

of the lime needed is relatively low. Lime may be used at 10-year intervals to maintain the lime content of the soil where these sources of nitrogen are used. Sulphate of ammonia is about three times as acid-forming as anhydrous ammonia, ammonium nitrate, and uramon. Nitrate of soda and cyanamid increase the lime content of the soil slightly; however, the increase is not sufficient to markedly increase the lime. One should become lime conscious and take care of the lime needs of the soil where acid-forming sources of nitrogen are used; however, there is no need to be alarmed about the immediate effect of anhydrous ammonia and ammonium nitrate on the acidity of the soil."

Based on their tables giving the effect of various sources of nitrogen on soil reaction, we have computed the amount of pulverized lime (90% neutralizing value) needed to correct the acidity resulting from the application of 100 pounds of the various materials.

Sources of nitrogen	Lbs. of 90% limestone needed to correct acidity produced
100# Anhydrous ammonia (82½% N)	164 lbs.
100# Ammonium nitrate (33½% N)	66 lbs.
100# Ammonium sulphate (20% N)	120 lbs.
100# Uramon (42% N)	84 lbs.

Certain other carriers of nitrogen have the effect of decreasing the acidity of the soil; for instance, 100 pounds of cyanamid would raise the pH of an acid soil and have the same effect as the application of 67 pounds of a 90% grade of agricultural lime. One hundred pounds of nitrate of soda would have the effect of an application of 32 pounds of 90% lime.

Topdressing Alfalfa

Topdressing old established fields of alfalfa with fertilizers rich in potash

will rejuvenate these fields and maintain good stands over a longer period. More alfalfa failures have resulted from starvation than from so-called winterkilling. It's true that where alfalfa plants have been weakened resulting from the depletion of root reserves in the heavy production of hay, such plants are more susceptible to winterkilling. Fertilizer mixtures such as 0-10-30+B (+B indicates that this fertilizer mixture contains boron) may be applied either in the spring or midsummer immediately following the harvesting of the first crop or in the fall before freeze-up at rates of from 300 to 500 pounds per acre. A deficiency of boron has become more acute in recent years, especially on the sandy loam soils, and is more pronounced in dry seasons. The inclusion of boron in the fertilizer mixture increases the cost about $1 per acre but may be looked upon as insurance. Treatment with a fertilizer containing boron will frequently increase alfalfa seed production even where there may not have been any apparent deficiency showing on hay production. "Alfalfa yellows" due to leafhopper injury to the second crop is frequently mistaken for boron-deficiency symptoms. Spraying alfalfa fields with an insecticide 10 days after the first cutting of hay is a positive preventive for "yellows" due to leafhopper damage.

Ten-ten-ten for Pastures

Pasture improvement through the use of 10-10-10* or other high-nitrogen fertilizers has opened up a great opportunity for low unit cost milk and meat production.

The protein content of nitrogen-treated pasture grasses as grazed by cattle in late May or early June will run from 18 to 22% on a dry matter basis. There are thousands of acres of pasture land in Wisconsin where late fall or early spring applications of high-nitrogen fertilizer, such as 10-10-10 (or ammonium nitrate, urea, or

* 12-12-12, 13-13-13, 14-14-14, or liquid 9-9-9 may be substituted for 10-10-10; anhydrous ammonia applied at 66 lbs. per acre plus 250 lbs. of 0-20-20 will supply the same amount of nitrogen, P_2O_5, and K_2O as contained in 500 lbs. of 10-10-10.

Fig. 4. George Zemple, Eau Claire County, cooperated with County Agent Willard Hamm in a demonstration on oats. The yield was increased from 60.2 bu. (no fertilizer) to 92.8 bu. where the combination of 250 lbs. of 0-10-30 plus 100 lbs. of ammonium nitrate was applied. (Boone Fine Sandy Loam).

TABLE III.—AVERAGE FOR 298 PASTURE PLOTS HARVESTED IN 1951, 1952, 1953, 1954.

Treatment	Number of clippings	Yield per acre (lbs.) (dry matter)	Pounds increase	Value of * increase	Cost of fertilizer	Net profit per acre
500# 10–10–10.....	2	6063	3262	$79.94	$18.00	$61.94
No fertilizer.....	2	2801				

* Pasture grass averaging 18% protein valued at $50 per ton.

anhydrous ammonia supplemented with phosphate-potash mixtures such as 0-20-20), will be found a highly profitable investment.

The results of several hundred acre-scale pasture demonstrations carried out over a period of the past four years have been averaged together and are shown in Table III.

Where anhydrous ammonia or the low-pressure solution forms of nitrogen such as "Nitrana 41" are used as a source of nitrogen, they should be cut or "knifed" into the sod at a depth of 4 to 6 inches. Applicators should be equipped with sharp-cutting coulters to prevent ripping or tearing the sod. The knives should be spaced not wider than 14 inches. Ammonium nitrate, urea, or other straight nitrogen fertilizer such as cyanamid, ammonium sulphate, urea, or the liquid forms such as non-volatile N-32, can be used as sources of nitrogen, but in all such cases, farmers should balance out the fertility with applications of phosphate-potash mixtures. Where pasture soils are acid, they should be limed.

Evidence that minerals (phosphate-

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Fig. 5. This old alfalfa field on the Roy Schlough and Sons' farm, Mazomanie, Wisconsin, shows response to treatments with 0-20-20 applied as a topdressing in the fall of 1952. The picture was taken in June 1954. Winterkilling was bad on the unfertilized (right) and weeds took over. Yields: left with 500 lbs. 0-20-20 per acre, 2 cuttings in 1953 and 1st cutting 1954—6,295 lbs.; right, with no fertilizer—2,760 lbs.

Improved Water-disposal Systems

By O. C. Medlock

Soil Conservation Service, Auburn, Alabama

"IF you are going to row-crop steep land, the only thing to do is to terrace it."

That was the comment of Douglas Lowell as we looked out over a field on his farm near Barnwell, Alabama, where he had established a new water-disposal system, with parallel terraces.

"We could hardly work that piece of land before it was terraced, because of washes," he said. "But I didn't have a bit of trouble combining soybeans after the parallel terraces were built.

"Where I had the old-type terraces, I had to leave some of the beans because I couldn't get the combine turned to harvest them," he continued. "I had at least two acres left that I couldn't harvest. With parallel terraces, I didn't lose any beans because I could get the combine to all of them."

This is a typical reaction of farmers who have improved water-disposal systems with most of the terraces constructed a uniform distance apart, or parallel. These new type systems are being planned by Soil Conservation Service technicians in Alabama and are being built by farmers throughout the State.

The development of improved water-disposal systems, with most of the terraces parallel, had an unusual beginning in Alabama. Area Conservationist C. T. Prout requested Engineer C. M. Sanders to assist him and Work Unit Conservationist W. T. Brown in laying out a tung orchard for A. L. Norrell of Mobile, Alabama.

Mr. Norrell wanted his tung trees planted on the contour. Sanders, Prout, and Brown laid out the orchard so the rows of tung trees were on the contour and the rows were parallel. When they finished, Brown asked Sanders, "Why can't we lay out terraces parallel if we can lay out tung rows on the contour and have them parallel?"

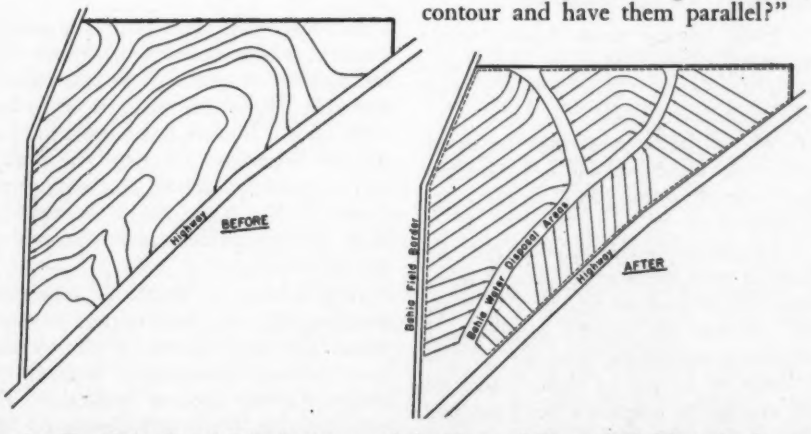

Fig. 1. The "before" and "after" pictures of the 50-acre field on Cecil Johnson's place near Geneva, Alabama, present an interesting contrast in old and improved water-disposal systems. There are 550 fewer feet in the parallel terraces than in the old terraces. The terrace outlets and field borders are in Pensacola Bahia grass.

Sanders thought a minute and replied, "I wouldn't say that you can't lay terraces out that way."

The question caused Sanders to study the possibility of getting most terraces in the field parallel. He soon had an opportunity to try his skill in laying out such a system. T. R. Nabors, Work Unit Conservationist at Dothan, asked Sanders to help him lay out a water-disposal system on Olaff Ivey's farm near Webb.

They laid out the system on one field and most of the terraces were parallel, or a uniform distance apart throughout. The local engineer has since assisted Mr. Ivey in planning and applying an approved water-disposal system on his entire farm. Mr. Ivey said of his system:

"I have not found a thing wrong with parallel terraces. They eliminate short rows and make my rolling land the nearest thing to level farming that I have found. Mechanized harvesting is much easier when there are an even number of rows between terraces, with the rows running the entire length of the terraces."

Guiding Principles

Soil Conservation Service engineers working on improved water-disposal systems soon discovered a few guiding principles. Among these are:

1. Each terrace must empty water into every natural drain or depression which it crosses. This will eliminate ponding in low places.

2. The disposal area must be developed with sufficient width to include all the steeply sloping land in the drain or depression.

3. In preparing the disposal area for planting permanent vegetation, a minimum disturbance of the soil is desirable. Where the natural depression is sufficiently defined to carry the full flow of water, it is best to disturb the soil only enough to prepare a good seedbed. Where the depression is not deep enough for this, it will be necessary to deepen and shape it so that it will serve as an outlet for the terrace.

4. The location of key terraces should be determined with care. These are usually placed where there is a change in slope, with resulting erosion.

Sanders interested Fred Kummer, Head of the Agricultural Engineering Department, Alabama Polytechnic Institute, and Arthur Cooper, who was a research worker with the Soil Conservation Service, in studying the improved water-disposal systems. Together they planned and applied a system at the Agricultural Engineering Experiment Station at North Auburn. The Experiment Station is continuing this study. It has already produced some very helpful information on ways of improving water-disposal systems.

Soon after the system was applied on the Ivey farm and the Engineering Experiment Farm, Mr. Sanders assisted local Soil Conservation Service employees in planning a water-disposal system on a 27-acre field on the Hugh Campbell farm near Arab, Alabama. This farm is in the Plateau section of Alabama, commonly referred to as Sand Mountain. Terracing has been a common practice in this section since the early settlers began cultivating the land. The early terraces were laid out approximately on the level and no consideration was given to providing outlets.

Mr. Campbell said of his improved system, which consists of three outlets planted to fescue grass and parallel terraces: "It is the only way to terrace land. Old-fashioned terracing just doesn't fit two-row farming, and doesn't do as good a job of controlling the water." Mr. Campbell's system has only one irregular terrace interval in the 27-acre field.

In planning an improved water-disposal system, the first step is to determine the depressions or drains that must be used for outlets. Next, the location for key terraces is found. The slope of the land will determine the spacing between terraces. This spacing

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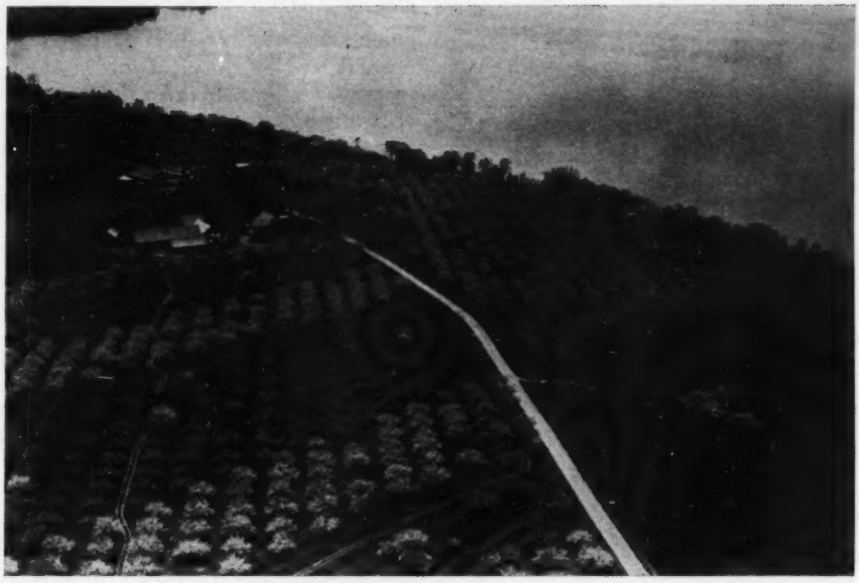

Fig. 1. A well-managed orchard showing uniformity of tree growth and characteristic varietal differences in bloom.

Fertilizing for Better Apples[1]

By Charles H. Blasberg

Department of Horticulture, University of Vermont, Burlington, Vermont

THE nutrition of apple trees is a very complex problem. Growers too often consider only the chemical elements they apply to the soil or the foliage. Actually, the environment—temperature, moisture, and sunlight—as well as most of their cultural practices affect the nutrition of the plant. The problem is further complicated because varieties differ in response and because a mature apple tree behaves more like a group of individual plants rather than like a single individual.

I have come to look upon an apple tree as a community of competing individuals. There seems to be but little sharing of any reserve foods. Thus, the food manufactured by the leaves on a given branch does not seem to be shared with other branches of the tree, although a portion may be shared with the root system. Growers often see trees of biennial-bearing varieties where half the tree fruits one year and the other half fruits the next. This alternation of bearing usually continues until some environmental or cultural factor upsets the rhythm.

Because of the complex nature of an apple tree and because growers have little, if any, control over many of the factors involved in its nutrition, they should not be surprised or discouraged by the conflicting reports on the kind

[1] Vermont Agricultural Experiment Station General Series Paper No. 50.

Fig. 2. Full bloom in an orchard attracts many visitors.

or amount of fertilizer to use. They should study their own situations and act accordingly.

From the preblossom period right through petal fall the orchard manager should make daily observations and notes. Thereafter, two observations each week may suffice until harvest time approaches unless some special problem arises. Apple trees are living and constantly changing. Each variety responds to changes in the environment in its own way. Good orchard management demands an understanding of the response of different varieties to environment, cultural practices, and fertilizers.

Everyone agrees that apple trees need the same nutrients as other green plants. If any one of them is lacking, abnormal growth occurs. As a rule, when the deficiency symptoms are observed, the tree has already been severely injured and had its crop-producing potential reduced. Growers must constantly be alert to avoid nutrient deficiencies. We need to devise some warning signals that will tell us the nutrient condition of the tree before visible symptoms appear. These guides are not readily available to growers at this time. Thus it would seem that where there is any question of enough nutrients being available, it is just good insurance to apply them.

Obviously, if the soil is well supplied with an available element there is no need to supplement it from the fertilizer bag. On the other hand, every good orchard manager will have tests made of his soil and his foliage so he knows what the story is. Unfortunately, a single test is not too helpful because the situation is constantly changing. It makes a considerable difference when and where the samples are collected or if the determinations are made in a dry season or a wet season. Such analyses coupled with tree performance under known cultural and environmental conditions are, however, most valuable when it comes to figuring out just what the fertilizer program should be.

Another aid which we have used and found very helpful is indicator plants. Thus alfalfa, which seems to have a much higher boron requirement than apples, makes a good indicator of the soil's ability to furnish this nutrient. Likewise, the common milkweed seems to be very sensitive to the amount of available magnesium in the soil. It has been our experience that in orchards where magnesium-deficiency symptoms appear on milkweed we soon find it on the apple trees. I suppose we might train ourselves to use other indicator plants for other elements if we were sufficiently alert and observing. But now that we have the advantage of foliar analyses along with soil analyses, we have a more positive method of detecting deficiency symptoms before they reach the critical stage.

Lime

Because apple trees are rather tolerant of acid soil conditions, many growers have tended to neglect liming. It has been our experience that orchard

management problems increase as the acidity of the soil increases. Why not give your soil the "acid test?" In Vermont, where magnesium deficiency has been a problem, we have been recommending the use of a dolomitic limestone with a high magnesium content. Through its use we aim to supply the needs of the trees for magnesium and calcium, to maintain a favorable soil pH so that the nutrient elements in the soil are more readily available to the tree, and so that the beneficial soil-inhabiting organisms have an opportunity to function normally. These are but a few of the beneficial effects of liming.

Although it may be to the grower's advantage to have his orchard located on a fertile soil, the inherent fertility of the soil is less important than the physical properties. We have seen too many examples of orchards planted on poorly drained or shallow soils. On such soils the trees may make excellent growth for a few years, but after that, regardless of management practices, it's difficult, if not impossible, to get a profitable crop. The amount of money a grower must spend to maintain adequate fertility on infertile soils represents a very small portion of his total growing expense. Eliminating a particular fertilizer element to save money is indeed poor economy.

We need much more information than is now available concerning the influence one element has upon the availability of other elements in the soil. The work of Wehunt and Purvis (7) shows that the calcium and magnesium present in the soil depress the amount of potassium in the leaves and vice versa. Likewise, they show a relationship between phosphorus in the soil and potassium in the leaves as well as the amount of potassium in the soil and nitrogen in the leaves.

In our own work we found that the same amount of nitrogen applied alone to the soil produced more terminal growth on bearing apple trees than when applied in combination with phosphorus and potassium. We had attributed this to the increased sod growth making more competition with the tree roots for both minerals and water. Some growers who have noted

Fig. 3. The Northern Spy variety is late to start fruiting because it tends to make too much wood growth during its early years in the orchard.

Fig. 4. Urea may be used in concentrate sprays up to 4X with but little danger of foliage injury. It is highly compatible with present-day pesticides.

this same condition have disced the sod just enough to destroy some of the absorbing roots but not enough to actually kill the sod. This is, however, not feasible under all situations. Mulching would certainly temporarily check the grass competition and provide a better moisture supply. Where moisture is not a limiting factor, an increase in the rate of fertilizer application to produce the desired amount of tree growth along with the maximum amount of sod growth would be good orchard management.

Through the years Vermont apple growers have had trouble with deficiencies of nitrogen, potassium, magnesium, and boron. If we have had deficiency of zinc, copper, or some of the other elements, we have not been aware of it. In one isolated case, calcium deficiency was observed in the orchard. It has been said that except for nitrogen the soil is capable of retaining the nutrients we apply. This may be true to a degree, but we find that many of them eventually reach the sea. It would seem, too, that we must avoid overapplication in any single year because of the depressing effect that one element may have on another, as well as to minimize the luxury consumption of a particular element.

Nitrogen

Most of the studies concerning fertilizers for apples have dealt with the influence of nitrogen—the regulator of plant growth. The importance of having an available supply of nitrogen during the periods of bloom and flush growth has been well established. Unless the tree has an abundant supply during these periods, the set of blossoms is likely to be low and the foliage smaller in size as well as less green. If the supply of nitrogen is limited during this early period of growth, but is plentiful during the end of the growth period, the end result is very different. In the first instance the nitrogen will be available to aid in fruit setting, to develop large leaves, and to initiate the development of a new set of flower buds. Nitrogen made available to the tree after these growth stages will tend to encourage the development of longer terminal growth, delay maturity, and interfere with the development of high fruit color.

Nitrogen in one form or another was long considered the only element the grower needed to apply to the soil around his apple trees. Many thought that because of the extensive root system which was constantly reaching out into new areas of the soil, apple trees could obtain sufficient amounts of all the minerals without supplementary applications. Such has not proved to be the case. It is true that on favorable soils apple roots penetrate to considerable depths and extend for long distances from the trunk of the tree. Nevertheless, application of nitrogen to encourage extensive growth and to promote high fruit yields causes the tree to make an increased demand upon the soil for all of the elements needed for normal development. When the supply of nitrogen is lacking or limited,

the tree makes little new growth and little demand upon the soil for the other elements. Such a situation, although it is not particularly harmful to the tree, is not modern commercial apple production. Our goal is to obtain the maximum production per tree of fine-colored, high-quality fruit. To do this we must supply not only nitrogen, but also make certain that all the elements needed by the tree and the fruit are available.

Some varieties, particularly Northern Spy, make an excessive amount of wood growth during the early years in the orchard. On such varieties the amount of nitrogen applied should be reduced and the pruning kept at a minimum until the fruiting habit has become established. We sometimes suggest to Vermont growers that once they know about how much nitrogen they must apply to their McIntosh trees, Delicious will need twice as much, whereas Northern Spy will need only one half the amount.

We still need more information as to when the tree makes its greatest demand upon the soil for mineral elements. If, as we often assume, this is during the time the tree is setting its fruit or making its flush of growth during the early part of the season, how can we account for the fact that magnesium-deficiency symptoms appear so late? This is true even on nonbearing apple trees.

Foliar Sprays

Since a number of research workers (2, 3, 4) have demonstrated that apple trees could assimilate nitrogen applied to the foliage, the Horticulture Department of the Vermont Agricultural Experiment Station has been studying the value of urea foliar sprays in the production of McIntosh apples (1). Results of these experiments, in progress five years, are truly phenomenal. Total fruit yield, size, and fruit color have been better on the trees receiving the foliar sprays than on the trees receiving the conventional soil application of nitrogen. Most Vermont apple growers have been applying urea foliar sprays with much success. This past season, because many orchardists switched from the ground application of pesticides to dusting from the air, they were forced to return to the conventional system of nitrogen application to the soil.

One of the reasons foliar application of nitrogen has been so successful is that it gives the grower more control over the nitrogen available to his trees. Soil applications of nitrogen are available to the tree only when soil temperature and moisture conditions are suitable. Foliar-applied nitrogen is available even though soil temperature and moisture conditions are unsuitable. Still another important point favoring foliar application is that its influence is quickly dissipated. The applications can be made early to assure an abundant supply of nitrogen for fruit set, leaf development, and fruit bud initiation and fruit size, and then discontinued so that only a moderate supply remains during the period of fruit coloration. Urea has been found to be highly compatible with present-day insecticides and fungicides. It may be applied in concentrate sprays up to 4X with but little danger of foliage injury.

Phosphorus

Although it is known that apple trees require phosphorus, a deficiency of this element has not been observed on mature trees in the orchard. We favor its inclusion in the fertilizer program because it does benefit the sod cover and thus helps to improve the fertility as well as the physical condition of the soil. We have a suspicion that phosphorus in some way aids root development and have always added some to the bottom of the hole when planting a young tree. We are confident that as time goes on we will learn of additional benefits from the application of phosphorus.

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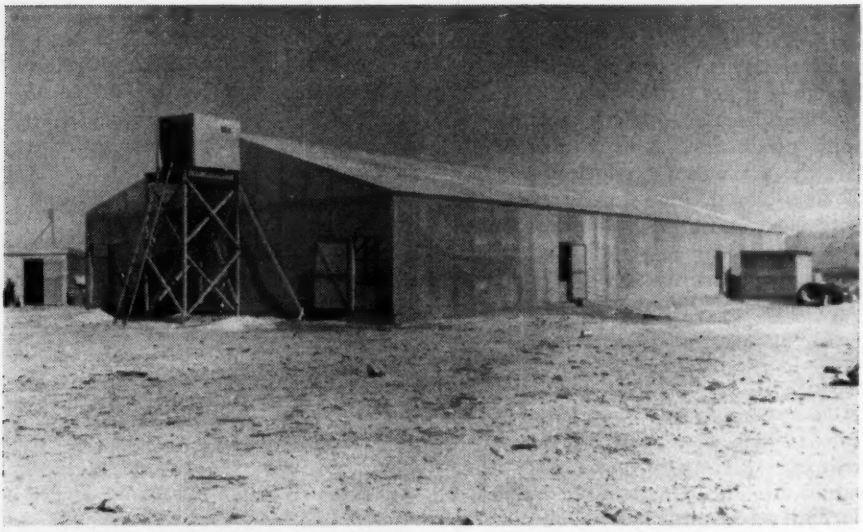

Fig. 1. Located about five miles northwest of Las Vegas on US 95, Sunland Farms, Inc., consists at present of one greenhouse 40 x 120 feet, pump and well, and the Todd home. The greenhouse is built to allow as much filtered sunlight as possible to the growing plants. Rippolite plastic translucent corrugated sheeting is used for all walls and roof as it transmits the portion of light that forms chlorophyll for use in photosynthesis.

LAS VEGAS— Hydroponics Headquarters

By John M. Fenley

County Agricultural Extension Agent, Las Vegas, Nevada

AS it is the unusual that made Las Vegas grow, it is not surprising to find something unusual in its agriculture as well. Just five miles northwest of Las Vegas on the Tonopah highway (US 95) is Sunland Farms, Inc., one of the largest hydroponics establishments in the Intermountain West.

"No weeds, no cultivation, and easy care are just three of the many advantages we have in hydroponics," say Mr. and Mrs. A. C. Todd, managers.

Hydroponics is the science of growing plants in a sterile medium by feeding them all the nutrients required in a fertilized water solution. The practice is old but had a big boost during World War II and the Korean War with our troops overseas.

Sunland's specialty at present is raising tomatoes for the luxury market in Las Vegas. Todd points out the attractiveness to Las Vegans of finding vine-ripened tomatoes available locally. This is especially desirable during the winter months.

Sunland is also making preparation for production of other vegetables. As tomato plants reach a stage beyond maximum yield, the hydroponics beds are cleared and replanted with new seedlings of bell peppers, green beans, and others. A year-round operation goal is the timely ripening of beautiful,

luscious vegetables that command top price.

The Todds came to Las Vegas from Salt Lake City expressly for the purpose of setting up a hydroponics greenhouse. They had studied many areas of the United States to determine the potential of this type of vegetable production. Weather records, climatic conditions, and marketing possibilities were carefully scrutinized for as far back as 12 years.

After long analysis they boiled the potential list down to five localities. Four of these are in Arizona: Beaver Dam, Phoenix, Tucson, and Yuma; while the fifth is Las Vegas, Nevada. All five areas compare very closely with each other in climate and weather, and number of sunlight hours during winter.

But Las Vegas seemed to be the most logical place because of two other important reasons. First, an unusual demand during the entire year for high quality produce. Second, practically none of the produce consumed in Las Vegas is grown locally.

Having decided this was the place, the next thing to do was to get a toehold. To raise funds the Todds incorporated Sunland Farms under Nevada law, sold stock, and began construction. Their present development consists of a plastic-covered greenhouse 40 by 120 feet, completely fitted with hydroponics beds and solution tank, a domestic well and pump, and a chemistry laboratory in their home. Plans for future expansion call for three more buildings the size of the one now in operation. The solution tank and pump can operate the four buildings.

Tomato plants are growing in the greenhouse in 20 beds, each 3½ by 30 feet. Although the beds are 12 inches deep, the planting medium is but 8 or 9 inches deep. Plants are spaced about a foot apart, giving the roots plenty of room in which to grow. About 70 plants are in each bed, arranged in two rows the length of the bed.

Brown-colored cinder lava gravel, quarried in southern Nevada, forms an ideal planting medium for hydroponics. It is ground and screened to a uniform pea size, and as it has a porous sur-

Fig. 2. The planting medium in the hydroponics beds is a brown-colored lava cinder. It is carefully ground to a pea-size gravel, screened, thoroughly washed, and treated prior to being placed in the beds. Depth of gravel in the bed is about eight or nine inches, plenty of room for root development. Cinder gravel is porous and through capillary action holds more than its own weight in water.

Fig. 3. Here Mrs. Todd is carefully weighing and measuring fertilizer to be added to the water. Actual amounts of nitrogen, phosphorus, potash, magnesium, and minor elements are all mixed into the solution according to a formula worked out by the Todds. Additional materials and water are combined into solution twice each week to keep nutrients at proper level.

face and interior, holds more than its weight of water.

All beds are connected to a central pipe line and pump system. Three times every day during warm weather and fewer times in cool weather, the solution is pumped from the tank into the beds, each time requiring 35 minutes. After all the solution, about 7,000 gallons, is moved into the beds, the pump is turned off and the solution returns by gravity flow to the storage tank. In two hours the gravel has drained to field capacity. Water is held right at the root zone by capil-

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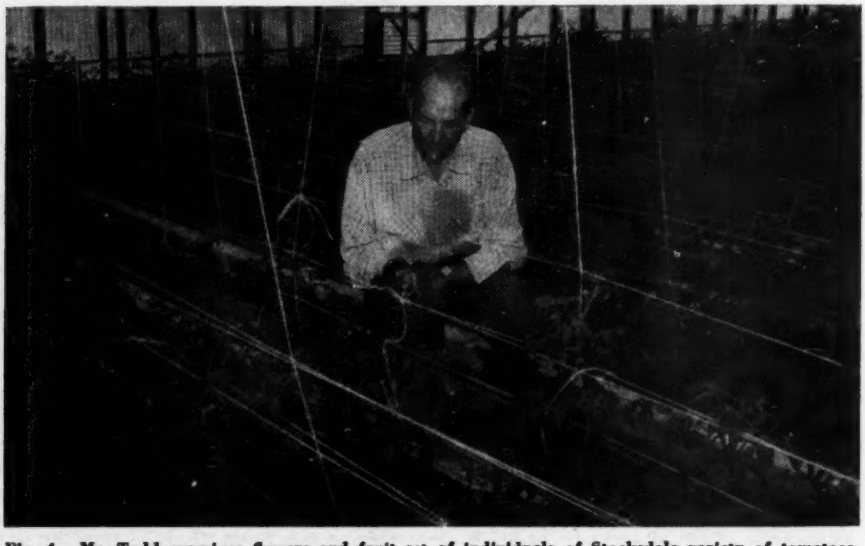

Fig. 4. Mr. Todd examines flowers and fruit set of individuals of Stocksdale variety of tomatoes. Other varieties under test are Stocks Cross Nos. 1 and 5, Lorin Blood, and Moscow VR.

Sod Seeding Improves Pastures

By W. R. Thompson

Agronomy Department, Mississippi State College, State College, Mississippi

SOME folks say there is nothing new under the sun, but there is something new in building and maintaining pastures. Secretary of Agriculture Benson said in a meeting at Purdue University recently that there is nothing sacred about doing things the old way. This is true and so comes into use the new pasture principle, *sod seeding.*

Nothing has ever come along that will mean as much to our soil conservation, water conservation, and grass-growing program as this new method will.

What we need is better pastures cheaper and not cheaper pastures. When you think about 60% of the area of the United States being in grasslands now and this being over a billion acres of land, you won't wonder why we in Mississippi worked for years to find a better pasture-building method.

T.V.A. started out in the early '40's to develop a method to interplant a grass or clover on areas where one or the other had faded out because of low fertility or overgrazing or both, or plant a grass and clover to start off. For six years the Mississippi Experiment Station, farmers, and machinery manufacturers have been experimenting with machines to distribute fertilizer and seed at the same trip and not destroy the existing sod. One of the popular bulletins put out by Mississippi Experiment Station was Bulletin 505 on sod seeding and one of the most popular circulars put out by Mississippi Extension Service was Publication 294 on the same subject.

When the kind of land and slope of the land we build pastures on are considered, it can be seen that we need to protect pasture land from erosion when planting, replanting, or interplanting. By using the sod seeder and running it on the contour, no soil is lost by erosion and all the rain that falls is caught in the trenches. This makes the seed come up and grow faster than where they are put on top of the ground with no preparation.

Sod seeding has been enthusiastically accepted and used by farmers everywhere and many send in most complimentary statements about it. One farmer wrote us last December, "I recently purchased a sod seeder and am very pleased. My oats are the finest in these parts. This machine is really going to pull us through this winter."

To plant pasture grasses and legumes in rows is a little revolutionary to some, but many of our top experiment station workers for years have been saying, "Plant in bands for better stands, quicker growth, and better mixtures of the grass and legumes."

Dr. P. G. Hogg, Assistant Superintendent, Delta Branch Experiment Station in Mississippi, has always contended that band seeding of grass and clover keeps the two growing better than broadcasting. In broadcast mixtures, either the grass or the clover usually takes over. High rates of nitrogen will cause the grass to take over, and high rates of phosphate and potash will cause the legume to take over. In rows, high rates can be used and both grass and clover will do better and stay in combination longer than when broadcast.

Sod seeding is going to be one of our best pasture fertilizer salesmen. The machines now being made will

make a seedbed, put down fertilizer, cover it with soil, and then plant a seed 1 to 2 inches deep, with another small seed on top of the ground.

R. E. Wagner, Agronomist, Beltsville, Maryland, says, "Band seeding experiments which have been carried on at USDA's Beltsville research center and at state experiment stations are pointing the way toward better stands and more forage production at less cost to the farmer."

Many stations over the nation have been studying new methods of putting in new and rebuilding old pastures at a cost farmers can afford and save the soil from erosion at the same time. Once erosion was called our National Problem No. 1. Now it is our greatest opportunity.

Professor W. C. Howell of Mississippi State College made this statement about sod seeding, "It will be a boon to both the grassland farming and the soil-saving program in that we can get good stands of grasses, cereals, and clovers, put down our fertilizer at the same time, do very little disturbing of the existing sod, and leave very little soil subject to the ravages of soil erosion." Leaders the world over know that nations fall or rise with their soil and this will always be true. Any principle which will help save and enrich soil is worth everyone working on and using where it can be applied.

One of the features of sod seeding most talked about is spacing and putting pasture plants in rows. Demonstrations and tests were first made on narrow spacings, 8 to 10 inches. The machine tore up too much of the sod, choked up often, and the plantings, if allowed to grow any during the spring, would choke out the grass and clovers that were to follow in the summer worse than wider spacing.

Demonstrations and tests were set up to see if wider spacings would not give the same amount of forage. This was found to be true as there is very little difference in the amount of forage produced. Mississippi Experiment Station data show that wheat spaced 10, 20, and 30 inches produced approximately the same amount of forage for the entire season; also that band seeding produced white clover two months earlier than broadcast. Crimson clover produced forage one month earlier in bands compared to broadcast. This is also true of some of the other legumes. Ryegrass produced nearly three times as much forage in bands early as broadcast plantings even though the total production for the season was about the same. Banding not only gives earlier production, but spreads out the total production over longer periods during the grazing season.

Many fertilizer specialists have found that banding of fertilizer will give the plant an opportunity to use most all of the fertilizer placed in its special band; while if phosphate, for instance, is broadcast much of it will be tied up on a low pH soil. We can afford to use high rates in bands just as well as broadcast and not worry about it being tied up. It has almost become a habit for farmers to fertilize when they seed and we want that habit to grow. Band seeding gives the farmers an opportunity to fertilize every time they make new pasture seedings or reseed old pastures with a grass or clover or combination.

We in the Southeast can use this principle a longer period of the year than the Midwest and North, but they can use it as we do to plant or interplant their grasses and clovers at the time they are supposed to be planted.

In the South the question comes up as to where to plant with the sod seeder. These are the areas:

Sudan and millet areas after grazing down in September.

Lespedeza areas after hay cutting.

Cotton and corn fields after harvest.

Worn-out pasture, to replant grass and clover.

Established Bermuda sod, carpet grass, Bahia sod, Johnson grass areas, and any of the clovers or legumes

where no grass is growing, such as white clover, Persian clover, red clover, winter peas, crimson clover reseeding areas, and on old broomsedge fields.

The next question that is asked is when, what, how to plant. I am listing below the time, season, and plantings to be made during that season:

Early Spring (March and April)

Plant Dallis, Bahia, Bermuda, lespedeza, Sericea lespedeza, and Johnson grass.

Plant either on fall- or spring-prepared seedbed or on pasture land with no preparation except from the sod seeder. You can plant Dallis, Bahia, or Bermuda in between rows of oats or other cereal that was planted in the fall.

Late Spring and Early Summer (May and Early June)

Plant Sudan, millet, grain sorghum, and silage sorghum.

Plant Sudan or millet after any spring-harvested cereal or after spring areas are grazed down or cut for hay or silage. Plant grain or silage sorghum after hay or grain harvest.

You can use a sod seeder on cultivated areas without preparation, but don't plant sorghum, grain sorghum, Sudan, or millet on sod land. Keep them on cultivated land.

Fall

Plant oats, wheat, rye, barley, vetch, winter peas, ryegrass, fescue, rescue grass, white clover, red clover, and crimson clover.

You may use combinations of any of these, but especially of cereals and legumes or grasses and clovers.

Another use of the sod seeder that is being made and accepted by farmers is planting cereals and legumes on cropland following crop harvest. As an example of this, as soon as corn is harvested, oats or wheat or a combination of oats, wheat, and vetch can be planted down the row without breaking the land. This same practice can be followed after cotton picking or any other crop harvest. It gives the quickest growth of any plantings we make because it is on a firm seedbed and on cultivated land. There is some fertilizer left over from the crop already there and when we add more, there is ample. These plantings are made for grazing during the winter and early spring, soil erosion control, and cover crop. Many farmers say some of their best grazing and grazing areas are on cropland planted following crop harvest with a sod seeder.

Need to Fertilize

One fact we found mighty quick on sod seeding is that we must fertilize. Without fertilizer the practice is not worth carrying out unless it is on mighty fertile land or following crops that had a lot of fertilizer residue left over. Where the fertilizer spouts of the applicator stop up for a short distance, that row can be found at a distance. Once in a while fertilizer gives out and a short distance is planted without fertilizer. That area can be picked out any time during the growing season.

Another fertilizer fact we found in the beginning was that small amounts would not do the job. Some thought because the fertilizer was being banded that we would get by with probably a much smaller application. So far this is not true. The reason banded grasses and cereals do so well is that they have plenty of plant food under the band. Seed planted broadcast or banded won't do well without fertilizer.

When I go out to study sod-seeded areas put in bands, I find most of them good because farmers just won't plant it this way without fertilizer. There is the fertilizer hopper right beside the seed hopper and it is just natural that they think both should have something in them during all of the seeding.

If areas have already had phosphate, potash, and lime applied to them, we just use nitrogen, either solid or anhydrous ammonia. This application

will average about 60 pounds of pure nitrogen per acre for the growing season. If phosphate and potash have not been applied, then mixed fertilizer is used by many farmers. Some use the minerals separately at time of planting. Five hundred to 600 pounds of a good mixed fertilizer put under the seed at time of planting has proved to be a fair application. Many will go much higher than this. It all depends on how many grazing days are expected from the crop being planted.

Anybody who tries to invent any new principle or practice that will work on pastures and leave the fertilizer out will probably be disappointed. We are telling farmers that this new sod seeding is to place fertilizer and seed and not to take the place of either one.

Where bluegrass is commonly used as the permanent pasture sod, there are three things sod seeding will do. One will be to place the fertilizer in the root zone, another is to plant some legume where the bluegrass has pushed most of the legumes out, and the third is to put down all the plant food needed while the planting is being done. I have studied a lot of areas in the northern part of the United States where there is need to put red clover or alfalfa back in the mixture or maybe grass back in the legume. In my estimation this new practice is going to be the way much of this is accomplished in pastures that are out of balance.

We are using sod seeding to save moisture in the late spring and early summer. We have found if we plow this land or disk it up, it will dry out as deep as we plow or disk and then we will have to get a rain before plants such as Sudan, millet, or sorghum will come up. Many farmers are going in on areas following spring grazing, cutting hay or silage, or harvesting grain and planting Sudan or millet the next day before the ground dries out or before grass and weeds come in to interfere with the new plantings. They will make a planting without breaking the land up and will get good stands and quick growth.

Anhydrous ammonia is becoming popular as a nitrogen source in many areas and there is a machine on the market today that will put down, say, 0-14-14, or 0-20-20, anhydrous ammonia, and seed all at one trip and not place any of them in contact with the other.

Seeding Rates

So far the seeding rates of banding pasture grasses and clovers have not changed from the old rates. We just get better stands and quicker growth and keep a better balance. Where we would recommend 100 pounds of small grain per acre for grazing, we still recommend 100 pounds of grain put in rows. We have cut Sudan and millet seedings from 30 pounds per acre to 10 pounds in rows. We are not cutting the fertilizer rate. As an example of seeding rates of sod seedings in rows, I am listing some seeding rates of different pasture plants:

Cereals	100	pounds
Ryegrass	25	"
Rescue grass	35	"
Winter peas	40	"
Vetch	25	"
White clover	2	"
Red clover	10	"
Crimson clover	20	"
Lespedeza, alone		
Kobe	25	"
Common	25	"
Korean	35	"
Sericea lespedeza	35	"
Johnson grass	20	"
Sudan or millet	10 to 15	"
Bermuda (hulled)	2 to 3	"
Bahia alone	15	"
Dallis alone	15	"

For Combinations

Oats or other cereals, 100 pounds; vetch, 25 pounds.

Ryegrass, 25 pounds; crimson clover, 20 pounds.

Lespedeza in sod, 10 pounds.

Dallis, 10 pounds.

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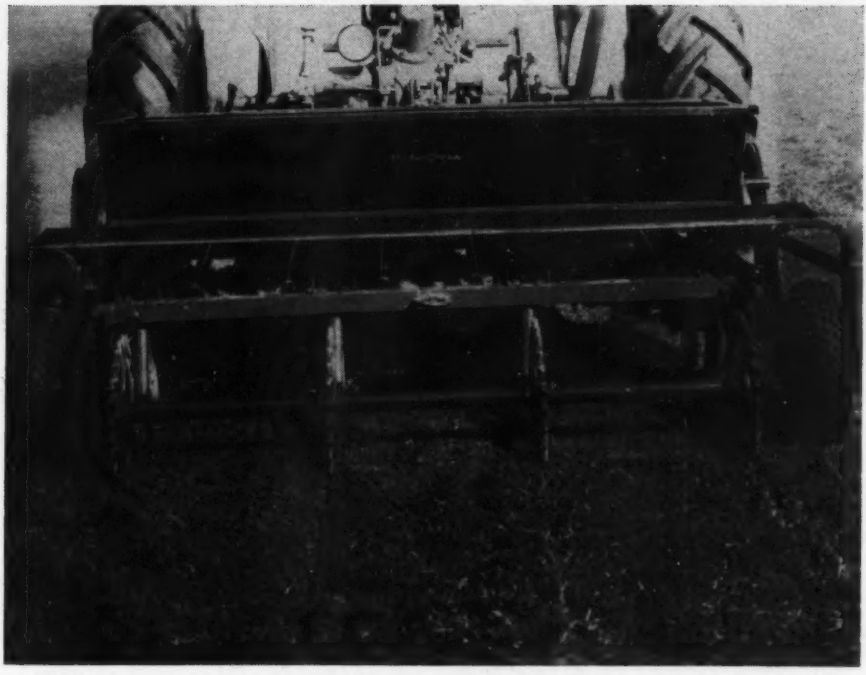


Above: Close-up of sod seeder showing small amount of damage done when fertilizer and seed are put in.

Below: Oats planted on old white clover and Bermuda sod to be grazed in late winter and spring.

Above: Dairy cows on good oat grazing at Louisiana Experiment Station, Franklinton, in late winter.

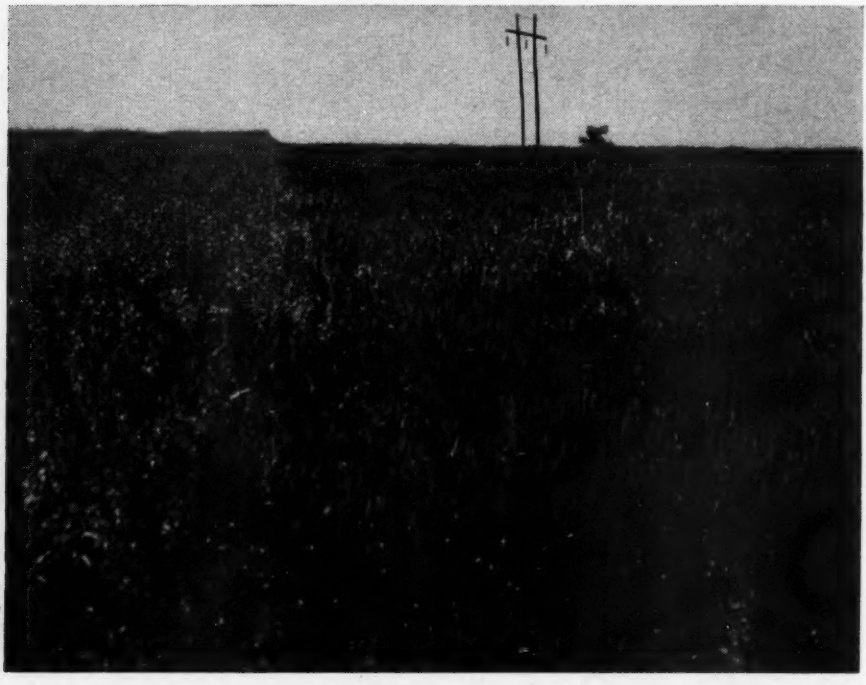
Below: Wheat planted in cotton middles following cotton picking for grazing, erosion control, and cover crop.

Above: Farmers studying the sod-seeding principle and showing real interest in its practicality.

Below: The author (left) and Professor W. C. Howell of Mississippi examining wheat growing in 40-year-old Bermuda sod.

Above: Old Bermuda pasture March 1. If not sod-seeded it would not have been ready for grazing until May.

Below: Grain crop of oats sod-seeded on Bermuda grass grazed winter and early spring then cows moved off for grain to make.



The Editors Talk

Our Cover Picture

Burley tobacco production in both acreage and dollar value ranks high among the several important types of tobacco grown in this country. This year the acreage in five states—Virginia, West Virginia, North Carolina, Tennessee, and Kentucky—totaled 325,000 acres with an estimated total production of 500,000,000 pounds. The estimated weighted average yield per acre for the burley-producing states as a whole is 1,450 pounds. This is considerably below what research authorities agree is an optimum yield—1,800 pounds or better per acre. To obtain the optimum yield and high quality needed for greatest profit calls for careful attention to all cultural practices including fertilization in which potash is extremely important.

In the April issue of this magazine, we were privileged to present "Fertilizer Recommendations—Burley Tobacco—1955," as issued by the Fertilizer Committee of the Burley Tobacco Workers Conference which met at Lexington, Kentucky, in August 1954. Concerning potash, the Committee had this to say:

"Lack of potassium is a common cause of low quality in tobacco. A deficiency of this element produces characteristic symptoms in tobacco plants. The leaves become distorted or puckered between the veins, the edges curl under, and a bronze-yellow color appears at the forward edge and tip of the leaf. As the deficiency becomes more severe, the yellowing spreads over more of the leaf and parts of the yellowed area may die and fall out. Leaf spot diseases (wildfire, angular leaf spot, and frogeye) are often much more severe on burley when grown on land deficient in potassium."

Our cover picture this month is the second cover illustration of potash-deficiency symptoms on burley tobacco which we have had. The other appeared on our November 1952 issue and was taken in a field in Virginia showing potash-deficiency symptoms. In the area from which that illustration came, the symptoms are seldom as extreme as can be found in Kentucky where the picture for this month's cover was made by Charles E. Gage, Agricultural Consultant for the American Tobacco Company, during a field inspection trip with Dr. E. M. Johnson, Plant Pathologist, Agricultural Experiment Station, Lexington, Kentucky.

In their 1955 recommendations the Committee referred to above say of managing soils for burley:

"Soils of low to medium fertility should be built up for burley through the use of crop residues, farm manure, phosphate and potash fertilizers, lime and grasses and legumes in the rotation. Good crops of burley are more certain on land so improved, and only moderate amounts of fertilizer are required for the tobacco. On much land where tobacco is grown, it has been too often necessary to add not only the fertilizers normally needed for the tobacco crop, but also enough to make up for the soil depletion of other crops grown in the rotation. A better plan in any soil-building program would be to apply adequate

fertilizer to the pasture, hay, and grain crops so that they would not deplete the soil. Such a fertilizer program would improve the soil and leave it in such condition that only enough fertilizer need be added to supply the needs of the tobacco crop.

"Where a grower finds it necessary to grow tobacco on the same field each year, he should take certain precautions to save valuable nutrients and topsoil. Considerable quantities of soluble nutrients may form in the soil in the fall after tobacco is harvested. Tobacco should be followed by a cover crop to prevent leaching and to reduce soil erosion during the winter."

Poor Pastures

Of course, serious droughts are something else to reckon with, but barring them, the major cause of poor pastures is lack of plant nutrients. That is the opinion of Dr. David F. Beard, Forage-crops Specialist of the United States Department of Agriculture. Citing nearly a score of common reasons for poor stands and failures—including planting seed too deep or too shallow, lack of firmness of seedbed, use of poor quality or unadapted seed, and competition by weeds or grain companion crops, he still thinks too little lime and fertilizer sums up the "poor luck" many farmers have in establishing a good pasture.

"Notwithstanding the fact that grasslands affect the income and profit made on at least 4 million of our nation's farms, pasture and range crops have long been relegated to the 'second table,'" Dr. Beard says. "The complacency shown by many growers in regard to regular and disastrous stand failures is costing them an extra $50 million a year for seed."

Research at USDA's Plant Industry Station, Beltsville, Maryland, and at several State experiment stations supports three basic conclusions in relation to the fertilization of Eastern pasture plantings:

1. Available plant nutrients in ample quantities increase the chance of establishing legume-grass seedings throughout the humid area.
2. Placement of applied nutrients, especially phosphorus, in relation to seed is often more important than the amount applied.
3. Proper fertilization hastens early seedling growth, helps overcome weed competition, and often increases the yield of the first harvested crop, whether hay or pasture.

Reporting on experiments carried out at Beltsville by the USDA's Agricultural Research Service, Dr. Beard says that placing high-phosphate complete fertilizer near the seed at planting time resulted in first harvest yields averaging 2,210 pounds of weed-free forage per acre. Weed content ranged from a trace to 22 per cent. The poorest plots were those fertilized or seeded broadcast; these averaged only 410 pounds of forage, contained from 40 to 70 per cent weeds, and were considered failures.

More about the fertilization of pastures will be found in the article on sod seeding by W. R. Thompson beginning on page 23 of this issue. While the author deals chiefly with the improvement and maintenance of Southern pastures, many of the principles discussed can be applied in other sections of the country.

The interest being taken in grassland farming as reflected by the type of research being done, along with the increasing application of results as a means of diversification in agricultural programs and preservation of the fertility of our soils, is most gratifying. It helps the insurance of "our way of life" for a rapidly increasing population with resources which in the case of acreage available have more or less reached their limit.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950.....	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951.....	37.9	51.1	163.0	304.0	166.0	211.0	19.50	69.30	....
1952.....	34.6	49.9	198.0	338.0	153.0	209.0	19.95	69.60	....
1953.....	32.3	52.2	79.7	251.0	148.0	204.0	17.45	52.60	
1954									
September...	34.55	53.0	116.0	236.0	153.0	207.0	17.25	61.60	....
October.....	34.67	53.6	93.2	212.0	145.0	208.0	17.55	60.20	....
November...	33.17	52.0	109.0	216.0	137.0	212.0	18.15	59.40	....
December....	32.67	50.0	105.0	254.0	139.0	212.0	18.55	59.60	....
January.....	32.51	42.4	113.0	283.0	140.0	214.0	18.75	56.80	....
February.....	31.69	36.8	117.0	297.0	140.0	213.0	18.55	55.20	....
March.....	31.87	....	118.0	310.0	136.0	212.0	18.25	53.40	....
April.....	31.93	....	217.0	315.0	136.0	209.0	17.65	53.40	....
May.....	31.51	46.0	223.0	315.0	140.0	213.0	17.45	53.10	....
June.....	31.43	39.5	121.0	382.0	140.0	206.0	16.35	52.00	....
July.....	32.11	38.0	88.0	279.0	140.0	197.0	15.25	54.00	....
August.....	32.74	50.6	75.2	179.0	130.0	190.0	15.25	50.10	....
Index Numbers (Aug. 1909–July 1914 = 100)									
1928.....	145	200	76	134	131	113	95	152	147
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	128
1931.....	46	82	66	83	50	44	73	40	107
1932.....	52	105	55	62	50	43	52	46	100
1933.....	82	130	118	79	81	84	68	57	90
1934.....	100	213	64	91	127	96	111	146	94
1935.....	90	184	85	80	102	94	63	135	116
1936.....	100	236	164	106	163	116	94	148	108
1937.....	68	204	76	89	81	109	74	87	114
1938.....	69	196	80	79	76	64	57	97	96
1939.....	73	154	100	84	88	78	67	94	98
1940.....	80	160	78	97	96	77	64	96	122
1941.....	137	264	116	105	117	107	82	211	138
1942.....	153	369	168	134	143	124	91	202	178
1943.....	160	405	188	235	174	154	125	231	270
1944.....	167	420	214	216	170	160	139	234	236
1945.....	181	366	205	232	198	170	127	227	240
1946.....	263	382	178	248	212	209	141	319	217
1947.....	257	380	232	248	336	259	148	381	262
1948.....	245	482	222	253	201	226	155	298	253
1949.....	231	459	184	244	193	213	139	192	232
1950.....	323	517	132	197	238	226	141	384	211
1951.....	306	512	233	346	259	239	164	307	269
1952.....	279	499	284	385	238	236	168	309	274
1953.....	260	522	114	286	231	231	147	233	240
1954									
September...	279	530	166	269	238	234	145	273	170
October.....	280	536	134	241	226	235	148	267	191
November...	268	520	156	246	213	240	153	263	237
December....	263	500	151	289	217	240	156	264	216
January.....	262	424	162	322	218	242	158	252	263
February....	256	368	168	338	218	241	156	245	258
March.....	257	...	169	353	212	240	154	237	262
April.....	258	.	311	359	212	236	149	237	270
May.....	254	460	320	359	218	241	147	235	308
June.....	253	395	174	435	218	233	138	231	230
July.....	259	380	126	318	218	223	128	239	223
August.....	264	506	108	204	202	215	128	222	211

Wholesale Prices of Phosphates and Potash **

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports [2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports [2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports [2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports [2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952	.849	3.98	5.47	.401	.793	15.25	.200
1953	.878	....	....	....	.793	15.25	.200
1954							
September	.895	....	....	.388	.765	14.75	.184
October	.895	....	....	.388	.765	14.75	.184
November	.895	....	....	.388	.765	14.75	.184
December	.895	....	....	.405	.825	16.00	.193
January	.895	....	....	.405	.825	16.00	.193
February	.895	....	....	.405	.825	16.00	.193
March	.895	....	....	.405	.825	16.00	.193
April	.895	....	....	.405	.825	16.00	.193
May	.895	....	....	.405	.825	16.00	.193
June	.895	....	....	.360	.720	13.45	.175
July	.895	....	....	.390	.735	14.00	.193
August	.895	....	....	.390	.735	14.00	.193
Index Numbers (1910-14 = 100)							
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952	158	110	112	72	83	63	83
1953	164	...	...	73	83	63	83
1954							
September	167	...	...	70	80	61	81
October	167	...	...	70	80	61	81
November	167	...	...	70	80	61	81
December	167	...	...	72	87	66	83
January	167	...	...	72	87	66	83
February	167	...	...	72	87	66	83
March	167	...	...	72	87	66	83
April	167	...	...	72	87	66	83
May	167	...	...	72	87	66	83
June	167	...	...	66	76	56	80
July	167	...	...	70	77	58	82
August	167	...	...	70	77	58	82

Wholesale Prices of Ammoniates**

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952	3.34	2.09	13.95	11.27	9.72	9.16
1953	3.26	2.27	11.04	11.19	7.39	7.09
1954						
September	3.09	2.18	11.51	10.85	9 78	10.09
October	3.01	2.18	11.55	11.26	9.64	9.94
November	2.98	2.18	11.85	11.78	8.80	9.23
December	2.98	2.18	11.98	12.41	8.50	8.35
January	2.98	2.18	12.00	12.35	8.32	8.32
February	2.98	2.18	11.16	12.23	8.50	8 50
March	2.98	2.18	10.47	12.45	7.82	7.82
April	2.98	2.18	9.90	12.41	6.68	6.23
May	2.98	2.16	9.97	11.92	6.19	6.25
June	2.98	2.02	9.91	11.55	6.23	5.92
July	2.98	2.02	10.01	9.43	6.68	7.14
August	2.98	2.07	9.88	11.12	7.04	6.86
Index Numbers (1910-14 = 100)						
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952	125	74	399	319	288	260
1953	122	80	315	317	219	201
1954						
September	115	76	329	307	290	287
October	112	76	330	319	286	282
November	111	76	339	334	261	262
December	111	76	342	352	252	237
January	111	76	343	350	247	236
February	111	76	319	346	252	241
March	111	76	299	353	232	222
April	111	76	283	352	198	177
May	111	76	285	338	184	178
June	111	71	283	327	185	168
July	111	71	286	267	198	203
August	111	73	282	315	209	195

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and all Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1928.....	148	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	130	127	86	56	130	102	77
1942.....	159	149	144	93	57	161	112	77
1943.....	193	165	151	94	57	160	117	77
1944.....	197	174	152	96	57	174	120	76
1945.....	207	180	154	97	57	175	121	76
1946.....	236	197	177	107	62	240	125	75
1947.....	276	231	222	130	74	362	139	72
1948.....	287	250	241	134	89	314	143	70
1949.....	250	240	226	137	99	319	144	70
1950.....	258	246	232	132	89	314	142	72
1951.....	302	271	258	139	93	331	152	76
1952.....	288	273	251	144	98	333	158	76
1953.....	258	262	247	139	100	269	164	77
1954								
September.	246	263	248	142	95	308	167	74
October...	242	262	248	141	94	308	167	74
November.	244	262	248	140	93	301	167	74
December..	239	261	245	140	93	300	167	77
January...	244	264	248	140	93	297	167	77
February..	245	264	248	139	93	291	167	77
March....	244	265	248	137	93	275	167	77
April.....	247	265	248	135	93	252	167	77
May.....	244	263	248	134	93	243	167	77
June.....	243	263	248	131	90	242	167	70
July.....	237	262	248	132	90	240	167	74
August....	233	260	248	133	91	252	167	74

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] Potash salts quoted F.O.B. mines; manure salts since June 1941; other carriers since June 1947. Beginning June 1954, muriate of potash quoted on both mine and port basis.

**** Where range of prices for fertilizer material is quoted, average figure is used. The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Arizona Seventeenth Annual Report, Commercial Fertilizers and Agricultural Minerals, Year Ending December 31, 1954," Agr. Exp. Sta., Univ. of Ariz., Mesa, Ariz., Spec. Bul., Feb. 1955.

"Rice Fertilizer Experiments, 1952-53," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Mimeo. Ser. 33, March 1955, R. L. Beacher.

"Fertilizing Materials, 1954," State Dept. of Agr., Sacramento, Calif., Spec. Pub. 255, April 1955.

"Annual Report, State Chemist of Florida, Fertilizers, Feeds, Foods, Drugs and Cosmetics, Pesticides and Seeds, Year Ending December 31, 1954," State Dept. of Agr., Chem. Div., Tallahassee, Fla.

"Fertilizers for Sweet Corn," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Bul. 223, Nov. 1954, E. T. Bullard and G. W. Woodbury.

"Fertilizers, Fertilizer Materials, and Rock Phosphate Sold In Illinois," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AG 1654, May 1955, L. T. Kurtz and N. G. Pieper.

"Extra Fertility for Crops from Poultry Manure," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Bul. 403, Dec. 1954, J. W. Sicer and S. A. Barber.

"Commercial Fertilizers in Kentucky, 1954 Including a Report on Official Fertilizer Samples Analyzed, July-December, 1954," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Reg. Bul. 121, June 1955.

"Inspection of Commercial Fertilizers and Agricultural Lime Products," Agr. Exp. Sta., Univ. of Mass., Amherst, Mass., Control Ser. Bul. 162, Oct. 1954.

"Starter Solutions, The Use of Concentrated Fertilizers on Vegetables, Flowers, Fruits and Ornamentals," Dept. of Hort., Mich. State College, East Lansing, Mich., Ext. Fldr. F-194, March 1955.

"Nitrogen Fertilization for Common and Coastal Bermuda Grass," Agr. Exp. Sta., Miss. State College, State College, Miss., Inf. Sh. 506, Dec. 1954, E. R. Beaty.

"Fertilizing Cotton in Southeast Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., R. Q. Brown, J. A. Roth, and G. E. Smith.

"Fertilizing the Potato Crop," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 509, May 1955, F. M. Harrington.

"North Carolina Fertilizer Laws," State Dept. of Agr., Raleigh, N. C., May 1955.

"Wheat Fertilization Studies in Western Oklahoma, Progress Report, 1953-54," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-270, July 1955, H. V. Eck and B. A. Stewart.

"Nitrogen 'Green Magic' Helps Cover South Carolina With a Blanket of Green," Agr. Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 395, Dec. 1954, H. Woodle.

"Effect of Fertilizer Placement on Perennial Pastures," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Bul. 805, April 1955, M. E. Riewe and J. C. Smith.

"Cotton Fertilizer Tests on Pullman Clay Loam Soil, 1952," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1642, Feb. 1954, E. L. Thaxton, Jr., and D. L. Jones.

"Influence of Nitrogen, Phosphorus and Potassium on the Yield of Sweet Potatoes on Hockley Fine Sandy Loam Soil," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1646, Feb. 1954, J. M. Coruthers and D. R. Paterson.

"Effect of Fertilizers on the Forage Production of Irrigated Oats," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1791, May 1955, C. S. Hoveland.

"Effects of Fertilizer and Row Systems on Corn Yields in Different Cropping Systems at Temple, 1953-54," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1794, June 1955, R. P. Bates and J. W. Collier.

"Cotton Yields in Pecos County as Influenced by Applications of Ammonium Nitrate and Superphosphate, 1954," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1795, June 1955, D. E. Longenecker, P. J. Lyerly, and P. D. Christensen.

"Influence of Source of Nitrogen Fertilizer on Yields of Acala Cotton in the El Paso Valley, 1954," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1796, June 1955, D. E. Longenecker, P. J. Lyerly, and P. D. Christensen.

"Effect of Fertilizer Placement and Sidedressing on the Yield and Grade of Granex

Onions," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1797, June 1955, G. L. Smith and D. R. Paterson.

"Flue-Cured Tobacco Fertilizer Recommendations," Agr. Ext. Serv., Va. Polytechnic Institute, Blacksburg, Va., Lflt. 22, Jan. 1955.

"Profitable Use of Fertilizer in the Midwest," Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Bul. 508, Dec. 1954.

"Commercial Fertilizers, Consumption in the United States, 1953-54," Agr. Res. Serv., USDA, Beltsville, Md., May 1955, W. Scholl, H. M. Wallace, and E. I. Fox.

Soils

"The Use of Woodchips and Other Wood Fragments as Soil Amendments," Agr. Exp. Sta., Univ. of Conn., New Haven, Conn., Bul. 593, March 1953, H. A. Lunt.

"Soil Factors Related to Growth and Yield of Slash Pine Plantations," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 559, April 1955, R. L. Barnes and C. W. Ralston.

"Land Judging in Indiana," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Bul. 395, April 1954, T. C. Bass and A. R. Bertrand.

"Soil Judging in Iowa," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Agron. 337, April 1955, F. W. Schaller and W. Scholtes.

"How to Reduce Dust Storms," Agr. Exp. Sta., Kans. State College, Manhattan, Kans., Cir. 318, March 1955, W. S. Chepil and N. P. Woodruff.

"Muck Soil Management for Onion Production," Agr. Ext. Serv., Mich. State College, East Lansing, Mich., Ext. Bul. 123, Feb. 1955, P. M. Harmer and R. E. Lucas.

"Soil Conservation in Michigan, Progress and Problems," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Spec. Bul. 394, Jan. 1955, C. R. Hoglund.

"Crop Response to Irrigation in the Yazoo-Mississippi Delta," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 531, May 1955, P. Grissom, W. A. Raney, and P. Hogg.

"Irrigation Efficiency Pays," Agr. Ext. Serv., Mont. State College, Bozeman, Mont., Ext. Cir. 257, Feb. 1955, H. L. Dusenberry.

"Stop Wind Erosion," Agr. Ext. Serv., Univ. of Nebr., Lincoln, Nebr., EC 55-107, Feb. 1955.

"Soil, Water, & Conservation for 4-H Club Members," Agr. Ext. Serv., New Mex. A. & M. College, State College, New Mex., Cir. 248, May 1954, H. E. Ray and J. E. Middleton.

"Soils of Wagoner County, Oklahoma," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Misc. Pub. MP-42, Feb. 1955, H. M. Galloway, F. Gray, and H. F. Murphy.

"Composts for Garden Soil," Fed. Coop. Ext. Serv., Oreg. State College, Corvallis, Oreg., Ext. Cir. 582, Dec. 1954, R. R. Clark.

"Effects of Clarion Extract on the Physical and Chemical Characteristics of the Soil," Agr. Exp. Sta., Pa. State Univ., State College, Pa., Prog. Rpt. 133, March 1955, R. B. Alderfer and W. C. Sharp.

"Conserving the Soil . . . Smyth County Points the Way," Agr. Ext. Serv., Va. Polytechnic Institute, Blacksburg, Va., Cir. 616, June 1954.

"Facts About Wind Erosion and Dust Storms on the Great Plains," USDA, Wash., D. C., Lflt. 394, June 1955.

"1956 National Agricultural Conservation Program Bulletin," USDA, Wash., D. C., ACP-1956, June 1955.

Crops

"1955 Vegetable Varieties for Alaska," Agr. Exp. Sta., Univ. of Alas., Palmer, Alas., Cir. 450, Dec. 1954.

"Factors That Influence Production, Size, and Quality of Peaches," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 547, Jan. 1955, J. R. Cooper.

"Castor Bean Varietal Trials in Arkansas," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Rpt. Ser. 47, March 1955, R. L. Thurman.

"Experimental Station, Summerland, B. C., and Experimental Substation, East Kelowna, B. C., Progress Report 1949-1953," Exp. Farms Serv., Dept. of Agr., Ottawa, Ont., Can., April 1955.

"Dominion Experimental Station, L'Assomption, Quebec, Progress Report 1947-1952," Exp. Farms Serv., Dept. of Agr., Ottawa, Ont., Can., Jan. 1955.

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"Report of General Activities for 1954 with Financial Statement for the Fiscal Year Ended June 30, 1954," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla.

"Florida Dictionary of Fruits, Vegetables, Flowers, Fiber Crops, Trees, Shrubs, Palms, and Vines," State Dept. of Agr., Tallahassee, Fla., Bul. 161, Jan. 1955, J. Shoemaker.

"Citrus Rootstocks," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla., Cir. 132, May 1955, J. N. Joiner.

"Papaya Growing in Florida," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla., Cir. 133, May 1955, R. W. Harkness.

"Vegetable Garden Production Guide," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla., Cir. 104R, April 1955.

"Growing Corn in Georgia," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Bul. 547, Rev. Dec. 1954, J. R. Johnson, W. H. Gurley, and J. F. McGill.

"Emerald Zoysia, Improved Hybrid Lawn Grass for the South," Agr. Exp. Sta., Univ. of Ga., Athens, Ga., Mimeo. Ser. N. S. 10, June 1955, I. Forbes, B. P. Robinson, and J. M. Latham.

"Growing Guava for Processing," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, Hawaii, Ext.

Bul. 63, Nov. 1954, R. A. Hamilton and H. Seagrave-Smith.

"Description and Quality of Some Mango Varieties Grown in Hawaii and Their Suitability for Freezing," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, Hawaii, Tech. Bul. 26, May 1955, K. J. Orr and C. D. Miller.

"The Isabella Grape," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, Hawaii, Ext. Cir. 350, Feb. 1955, W. Yee.

"How to Have an Attractive Lawn," Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 729, Oct. 1954, H. R. Kemmerer and F. F. Weinard.

"A Handbook for Rose Growers," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Bul. P117, Feb. 1955, G. J. Buck and E. C. Volz.

"Roses," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Pamph. 218, March 1955.

"Kansas Corn Tests for 1954," Agr. Exp. Sta., Kans. State College, Manhattan, Kans., Bul. 373, Feb. 1955.

"Cranberries and Cranberry Products," Agr. Exp. Sta., Univ. of Mass., Amherst, Mass., Bul. 481, May 1955, C. R. Fellers and W. B. Esselen.

"Ninety-Third Annual Report of the Secretary of the State Board of Agriculture and the Sixty-Seventh Annual Report of the Agricultural Experiment Station, July 1, 1953 to June 30, 1954," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Vol. 49, No. 12, June 1955.

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"Varietal Trials of Farm Crops," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Misc. Rpt. 24, Rev. June 1955.

"Pruning, Cluster Thinning, and Potash Fertilizer Experiments with Concord and Delaware Grapes Growing on Dog Ridge Rootstocks," Agr. Exp. Sta., Miss. State College, State College, Miss., Tech. Bul. 41, April 1955, J. P. Overcash.

"First for Forage Alfalfa," Agr. Ext. Serv., Univ. of Mo., Columbia, Mo., Fldr. 35, June 1955.

"Yields of Grass Species and Varieties Under Irrigation in Montana," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Tech. Bul. 508, April 1955, R. E. Stitt.

"Research Program for the Improvement of Hard Red Winter Wheat," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Bul. 425, June 1954.

"Chrysanthemum Improvement," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Bul. 428, Jan. 1955, G. Viehmeyer.

"Introduced Forage Grasses for Nebraska," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Cir. 95, Jan. 1955, F. D. Keim and L. C. Newell.

"Soybean Production in Nebraska," Agr. Ext. Serv., Univ. of Nebr., Lincoln, Nebr., E. C. 192, Rev. 1954, J. D. Furrer and D. G. Hanway.

"Chysanthemum Culture in Nebraska," Agr. Ext. Serv., Univ. of Nebr., Lincoln, Nebr., E. C. 1273, Rev. 1955, G. Viehmeyer and W. C. Whitney.

"Spring Small Grain Varieties for Nebraska 1955," Agr. Ext. Serv., Univ. of Nebr., Lincoln, Nebr., E. C. 55-101.

"Thirty-eighth Annual Report of the New Jersey State Department of Agriculture, July 1, 1952-June 30, 1953," State Dept. of Agr., Trenton, N. J.

"Sixty-Fifth Annual Report of the New Mexico Agricultural Experiment Station for the Fiscal Year Ended June 30, 1954," Agr. Exp. Sta., New Mex. A. & M. College, State College, New Mex.

"Reseeding Abandoned Cropland or Depleted Range Areas," Agr. Exp. Sta., New Mex. A. & M. College, State College, New Mex., Bul. 395, Jan. 1955, D. R. Burnham.

"Coastal Bermudagrass in Southern New Mexico," Agr. Exp. Sta., New Mex. A. & M. College, State College, New Mex., Press Bul. 1133, March 1955, M. L. Wilson, C. E. Watson, and G. Staten.

"Sixty-Seventh Annual Report of the New York State College of Agriculture and of the Cornell University Agricultural Experiment Station for the Year 1953-54," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y.

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"Growing Bunch Grapes in North Carolina," Agr. Ext. Serv., N. C. State College, Raleigh, N. C., Rev. Ext. Cir. 311, Nov. 1954, T. T. Hatton.

"Research for Living, Annual Report—1954," Agr. Exp. Sta., N. Dak. Agr. College, Fargo, N. Dak., Bul. 396, Jan. 1955.

"Cimarron Oats," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-457, June 1955, A. M. Schlehuber.

"Tests of Cotton Varieties for Stripper Harvesting, 1952 and 1953," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-251, Feb. 1954, J. M. Green and E. S. Oswalt.

"1954 Cotton Variety Tests," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-266, Jan. 1955, J. M. Green, E. S. Oswalt, and J. D. Bilbro, Jr.

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"Growing Rhubarb," Fed. Coop. Ext. Serv., Oreg. State College, Corvallis, Oreg., Ext. Cir. 584, March 1954, R. R. Clark.

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"Lawns for South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C.,

Cir. 308, Rev. March 1955, A. E. Schilletter and H. A. Woodle.

"1955 Grassland and Pasture Contests in South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Cir. 398, Jan. 1955, H. A. Woodle.

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"1954 South Dakota Corn Performance Tests," Agr. Exp. Sta., S. Dak. State College, Brookings, S. Dak., Cir. 112, Feb. 1955, D. E. Kratochvil and D. B. Shank.

"Research in Crops and Soils," Agr. Exp. Sta., S. Dak. State College, Brookings, S. Dak., Cir. 113, Feb. 1955, W. W. Worzella, et al.

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"Orchard Management," Agr. Ext. Serv., Tex. A. & M. College, College Station, Tex., Bul. B-73, Rev. March 1954, J. F. Rosborough.

"Warm-Season Grass Tests in the Wichita Valley," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1792, May 1955, L. E. Brooks and E. C. Holt.

"Legume Tests at the Winter Garden Experiment Station, 1952-55," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1799, June 1955, C. S. Hoveland.

"Range Management Versus Drouth," Agr. Ext. Serv., Tex. A. & M. College, College Station, Tex., C-320, Feb. 1954.

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"64th Annual Report of the Washington Agricultural Experiment Station, Institute of Agricultural Sciences," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 559, Dec. 1954.

"Establishing Young Apple Trees in Central and Eastern Washington," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Mimeo. 1661, March 1955.

"Strawberry Production Recommendations, 1955," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Mimeo. 1664.

"Oat Identification and Classification," USDA, Wash., D. C., Tech. Bul. 1100, April 1955, T. R. Stanton.

"The Secretary of Agriculture Reports on the Work of the United States Department of Agriculture for the Year 1954," USDA, Wash., D. C.

"Grass Crops in Conservation Farming," USDA, Wash., D. C., Farmers' Bul. 2080, May 1955, T. Dale and G. F. Brown.

"Commercial Production of Greenhouse Tomatoes," USDA, Wash., D. C., Farmers' Bul. 2082, May 1955, W. S. Porte and F. F. Smith.

Economics

"Enterprise Costs and Returns on Rice Farms," Agr. Exp. Sta., Univ. of Ark, Fayetteville, Ark., Bul. 549, Feb. 1955, M. W. Slusher.

"1955 Diverted Acres in Arkansas," Agr. Ext. Serv., Univ. of Ark., Fayetteville, Ark., Lflt. 215, March 1955.

"Colorado Agricultural Statistics, 1953 Final and 1954 Preliminary Including Historical Tables," State Dept. of Agr., Denver, Colo., Vol. 1, No. 5, May 1955.

"Connecticut Vegetable Industry and Its Outlook for 1955," State Dept. of Agr., Hartford, Conn., Bul. 132, April 1955.

"Farm and Home Development, What Would You Do?" Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Cir. 381, Nov. 1954, J. J. Lancaster.

"It Can Be Done, Farm and Home Development," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Cir. 383, Dec. 1954, S. J. Brannen.

"Minimizing the Ingredient Cost of Fertilizer Mixes," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Res. Rpt. AERR-8, May 1955, E. R. Swanson.

"Indiana Crops and Livestock, Annual Crop Summary, 1954," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., No. 351, Dec. 1954.

"Costs, Returns and Capital Requirements for Soil-Conserving Farming on Rented Farms in Western Iowa," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 423, March 1955, H. R. Jensen, E. O. Heady, and R. V. Baumann.

"Resource Returns and Productivity Coefficients in Selected Farming Areas of Iowa, Montana, and Alabama," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 425, April 1955, E. O. Heady and R. Shaw.

"How Big Will Our Farms Get?" Agr. Exp. Sta., Iowa State College, Ames, Iowa, Vol. 9, No. 11, May 1955, D. E. McKee and E. O. Heady.

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"Which Wheat Program?" Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., PNW Bul. 11, Jan. 1955.

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Sod Seeding Improves Pastures

(*From page 26*)

Bahia, 15 pounds.

In the South there is one thing we have got to watch on our plantings in the fall. On our heavy sods we must wait until just before the sod is dormant to interplant cereals or clovers. If we don't do this, the fertilizer applied will cause the sod to put on an extra growth, especially when it rains, and the young plants will be choked back.

There are many plantings that can

be made long before the sod areas are ready. This spreads out the planting period over more days than if all had to be planted at the same time. For example, as soon as silage is harvested from sorghum or corn, and this often takes place in late August or early September, the sod seeder is taken and plantings are made going down the row without breaking up the land. These come up a lot quicker and grow faster than if the land is broken and it is necessary to wait for rains before the plants can come up.

A Dozen Advantages

Many of our sod crops really need renovating once in a while and this sod seeder can be used to renovate, put out fertilizer, and make another planting of seed if more plants are needed on the pasture. Some of the sods that get sod-bound and need renovating are: Common Bermuda, Coastal Bermuda, Johnson grass, Bahia grass, bluegrass, and fescue.

There are a lot of advantages of sod seeding. I am listing one dozen:

1. The sod is not destroyed. After a rain, you can hardly tell the sod seeder went through the sod.
2. Less moisture is lost than if the land is completely prepared.
3. Seed and fertilizer can be put out at one trip, saving time and expense.
4. Plantings can be made on cultivated land after grain or spring hay harvest without having to break the land and lose moisture. You will also get a quicker stand, if dry weather sets in.
5. Band seeding gives better stands and growth than broadcasting seed, especially if broadcasting on top of the ground.
6. Old, worn-out pasture can be replanted without losing what sod is there.
7. Grass or cereal can be planted in a clover, or clover or legume can be planted in grass sod and get a stand. If seed are sown on top of the ground in the sod, poor stands will result.
8. Stands of winter peas can be had the first year using half the regular seeding rate in heavy Bermuda and Johnson grass.
9. Using the sod seeder is one of the best ways to get a good stand of Dallis grass.
10. The sod seeder is a top tool for soil conservation and water conservation on sloping pasture land. If the sod seeder is run on the contour, the soil won't wash off as badly before cover grows, and the moisture that falls will hold better.
11. Sod planting costs about half as much, or less, than plowing up and starting all over again, if this were practical.
12. You can use the sod-seeding principle on sod land, cultivated land, or temporary grazing areas. You can use it throughout the year to seed, fertilize, and renovate pastures.

Improved Water-disposal Systems

(*From page* 14)

is adjusted to provide for an equal number of rows between terraces, based on the common spacing of rows. A distance which provides for an even number of rows enables the farmer to use two-row equipment if he cares to do so.

Comments of other farmers who are using improved water-disposal systems:

R. T. Riemer, of Foley, Alabama, had an improved system planned and applied on a 140-acre field he used for producing hybrid seed corn. He stated: "Parallel terraces did not interfere with our operations in producing hybrid

seed corn. We used four-row equipment in planting and cultivating. Our detasseling machinery takes six rows and it was operated without a bit of trouble.

"We used a two-row picker to harvest the corn," he continued. "Where we did not terrace, we had washes 6 to 7 inches deep in the middles of our soybean rows and we did not have much rain compared to what we usually get. There were no washes in the terraced field. We expect to get 300 pounds of Bahia grass seed per acre from the meadow disposal area we planted to take care of the terrace water."

C. Homer Miller of the Georgetown community of Mobile County, said: "Parallel terraces give me all long rows and the terraces are easier to maintain. Old-type terraces made too many short rows and caused me to tear down a lot of my crops in turning at the end of the short rows."

By 1953, the Soil Conservation Service employees in Alabama were convinced that we could materially improve the water-disposal system for row cropland. They held a meeting to train its engineers and Area Conservationists to plan and apply improved systems. This meeting was held on the D. L. Yarbrough farm near Prattville. Sanders and J. C. Elder, local engineer, planned with those present an improved water-disposal system for a 150-acre field on Mr. Yarbrough's farm.

Their plan provided for about 20 acres of the 150 acres to be developed for the meadow disposal areas. The terraces were surveyed and there were only three irregular terrace intervals in the entire field. The old system that had been ineffective was torn down and the new terraces had much better alignment than the old ones. The meadow was planted to Coastal Bermuda grass which is used for hay.

This meeting showed the Area Conservationists and the engineers the advantage of improved water-disposal systems. They went home and began to help farmers plan and apply these systems in all sections of the State. At the end of 1954, Area Conservationists reported that improved systems have been established on 449 Alabama farms. There have been 976 miles of parallel terraces built on 10,260 acres of row cropland.

Soil Conservation Service workers in Alabama no longer think of conventional terraces and parallel terraces. They plan and survey improved water-disposal systems with meadow water-disposal areas in each drain and the maximum number of terraces parallel. Service engineers and Experiment Station workers are continuing their studies in fields throughout the State and on the Experiment Station to further improve the systems and fit them to all kinds of land.

Where feasible, the disposal areas are seeded to thick-growing, erosion-resisting grasses or legumes without shaping or disturbing the soil in the drain. Only enough soil is disturbed to prepare a good seedbed. In some areas, the depressions are so shallow that the disposal areas must be shaped.

In very shallow drains W-outlets are frequently prepared by plowing the soil to the middle of the outlet. This makes a broad channel down each side of the outlet. Where the drain is more distinct, yet not deep enough to serve without shaping, it is shaped into a broad V-outlet.

All outlets are seeded with thick-growing, erosion-resisting plants to prevent washing. Bahia grass has become a very popular grass for vegetating outlets, especially on the light soils. The Bermuda and fescue grasses serve well on many other soils.

Improved water-disposal systems enable farmers to use modern farm machinery, to conserve their soils. Such systems can be applied on all lands suitable for clean-tilled row crops. Farmers who have the improved systems are very enthusiastic about them and the demand for these systems from other farmers is increasing rapidly.

Tips On Pruning and Fertilizing Brambles

TO help berries such as the youngberry and the thornless boysenberry that have already borne their crop get ready to bear a good crop the next year, cut all the old canes and fertilize the new plants in early summer. By cutting out the old canes and burning them soon after blackberries or dewberries are harvested, the disease hazard is reduced. If fertilized properly, the new canes have a chance to grow vigorously during the remainder of the summer. A fertilizer high in nitrogen such as a 6-8-8 or an 8-8-8 should be applied at the rate of one-half pint per plant, in a circle from 9 to 12 inches from the plant, and worked into the soil.

Youngberry and boysenberry, both in the trailing, or dewberry class, can be fertilized and cultivated by the same method used for the erect type blackberry. Dewberries are sometimes grown by the hill system and remain on the ground all summer and until March the following year. At this time, when danger of killing by cold weather is past and just before blossom time they are trained on either a stake or on a trellis. Cultivation is much easier, however, if they are trained to a pole or trellis all summer.

In pruning blackberries, only the canes which bore fruit in the current year are cut out. These are burned and the new ones are fertilized in June or July. Both blackberries and dewberries should be cultivated to keep down weeds and grass.

All brambles should be mulched with straw if available. Small grain straw is excellent. Small grain straw will decay and has to be renewed every year. It can be applied in spring or summer. Mulching conserves moisture and keeps the soil cool. Weeds and grasses can be kept down by mulching, reducing labor needed for weeding.

When new plants for additional planting are desired, the tips of the growing vines or canes can be covered in late summer with a handful of dirt. Roots will be developed by spring. The new plant can be cut off about a foot from where it rooted and transplanted in early spring. . . . —*John A. Cox, Agricultural Extension Horticulturist, Louisiana State University.*

Potash Topdressing Boosts Alfalfa

SIXTY to 80 pounds of potash per acre each year increase the life of alfalfa stands, says Earl Jones, Ohio State University Agronomist. Experiments at the Ohio Agricultural Experiment Station, Wooster, show that 300 to 400 pounds of 0-20-20 are needed to maintain yields and stands of alfalfa. Although phosphorus is needed, the essential element is potash, Jones states.

Farmers who topdress alfalfa and use wilt-resistant varieties—Ranger or Buffalo—now report satisfactory yields from 6- and 7-year-old stands instead of the usual 3 and 4 years. Jones advises farmers to topdress in the fall or spring. Another good time is just after the first cutting is removed, before the second growth gets a good start.

Fertilizing Will Cut Production Costs

(*From page* 12)

Fig. 6. A 3-row tractor mount anhydrous ammonia applicator applying nitrogen at the knee-high stage.

potash mixtures) are needed to make possible maximum benefit from the application of nitrogen fertilizer is shown in Table IV where the average of all hay and pasture plots carried out over a period of several years is recorded.

Fertilizers for Corn

Wisconsin's corn crop in 1954 hit an all-time high in terms of total production—better than 155,000,000 bushels—with an average yield of 58 bushels per acre. In 1953, Wisconsin topped the

TABLE IV.—AVERAGE YIELDS OF ALL HAY[1] OR PASTURE PLOTS WHERE AMMONIUM NITRATE ONLY WAS COMPARED WITH AMMONIUM NITRATE IN COMBINATION WITH 0-20-0 OR 0-20-20 AND NO TREATMENT. (YIELDS OF THE 0-20-0 AND 0-20-20 PLOTS WITH NITRATE WERE AVERAGED TOGETHER.)

Treatment and rate per acre	Hay yield per acre	Increase per acre	Value of increase[2]	Cost of fertilizer[3]	Profit over cost of fertilizer
Ammonium nitrate at 200# per acre (average of all plots)	3,289	1,429	$14.29	$ 9.00	$ 5.29
Ammonium nitrate at 200# plus 0–20–0 or 0–20–20 at 250#	4,749	2,889	28.89	12.90	15.99
No fertilizer	1,860				

[1] Mostly timothy with 20 to 30% clover.
[2] The entire cost of ammonium nitrate and one half the cost of 0-20-0 and 0-20-20 charged here. Ammonium nitrate figured at $90 per ton.
[3] Hay figured at $20 per ton.

Fig. 7. Bulk truck spreading of fertilizer is growing in popularity. Among the advantages are: (1) By saving on bags and bagging, farmer gets fertilizer on land at lower cost; (2) Saves labor at factory; (3) Saves dealer and farmer job of handling, loading and unloading, hauling to field and filling hoppers; (4) Gets the job of spreading done for farmer during busy seasons.

nation with an average yield of 58½ bushels per acre. Many factors have combined to make these high yields and this high total production possible, among which are: Hybrid seed corn, high population (more stalks per acre), weed control with chemicals by both pre- and post-emergence sprays, disease control by seed treatment with fungicides, the mixing of insect-repelling compounds with fertilizers applied with attachment on corn planter for control of wire and corn rootworms, root maggots, etc. But high fertility was and continues to be a most important factor in obtaining these high yields. High-nitrogen levels obtained through the growing of our record crops of legumes the past several years, the factor of more careful handling and use of animal manures, also the great increase in the use of nitrogen fertilizers, all have contributed to higher yields of corn in Wisconsin. The use of ammonium nitrate, anhydrous ammonia, or nitrogen solutions applied both as broadcast plow-down or as a "preplant" treatment or applied as a sidedressing after the corn has been planted has become a part of general farm practice in the past 4 or 5 years. Many farmers are now applying fertilizer according to prescription or formula. The County Pacemaker Corn Clubs have been an important factor in encouraging farmers to apply the kind and amount of fertilizer required to raise the fertility of the soil to adequate levels for maximum production.

Here are some recommendations that have come out of our many years of demonstrational and experimental work with fertilizers on corn.

1. Starter fertilizer is important in getting the corn crop off to a vigorous start. Where a farmer has applied extra nitrogen as a "preplant" or where he plans to sidedress with nitrogen, the rate of application of starter should be increased to safe limits—250 to 300 pounds per acre where drilled, 200 to 250 lbs. per acre where checked or hill-dropped (30% smaller application suggested on sandy soils).

2. On low-level fertility land where no manure is applied, no clover sod to

plow under, we recommend liberal applications of minerals (300 to 500# of 0-20-20 or 0-10-30) supported with plow-under or sidedress applications of nitrogen. Complete balanced fertilizer mixtures such as 10-10-10 or other high-grade 1:1:1 ratios at rates up to 1,000 lbs. per acre can be plowed under or disced into the land. (Nitrogen supplied in the form of mixed fertilizer is somewhat higher costing than where applied in the form of ammonium nitrate, urea, cyanamid, ammonium sulphate, the nitrogen solutions, or anhydrous ammonia.)

3. The application of anhydrous ammonia, urea, ammonium nitrate, or other nitrogen fertilizers in late fall on heavy silt or clay loam soils by plowing under or cutting into fields that have been fall-plowed along with mixtures such as 0-20-20 or 0-10-30 is recommended. (Autumn application of nitrogen fertilizer is not recommended on sandy soils.)

4. On fields where manure is plowed down with clover or alfalfa sod, starter fertilizer such as 4-16-16 or 5-20-20 at rates up to 200 or 300 lbs. per acre may be all the commercial fertilizer that a farmer can reasonably expect profitable returns on. However, additional nitrogen may be found profitable under some conditions, for example, where farmers are shooting for 150-bushel yields on the silt or clay loam soils in the southern part of Wisconsin and where population is stepped up to the 18,000 stalks per acre, where corn is marketed at somewhat higher than commercial prices, or where soil tests indicate a need for extra nitrogen.

Buy Fertilizer in the Fall

Fall purchase of fertilizer will help to relieve the lack of factory storage space and will help to get away from "the last minute run" on fertilizer factories in late spring. It will tend to provide better service in delivery, and will increase the supplies available to farmers who can also relieve their rush of spring work by fall application. Here are a number of suggestions for fall use:

Fig. 8. Here on the Len Luce farm at Reedsburg, Wisconsin, the Agricultural Teacher and Trainer of Veterans in cooperation with a fertilizer company applied the kind and amount of fertilizer recommended by the Soils Department based on soil tests. The result was an increase of 116.7 bu. per acre. The cost per acre for this heavy rate treatment amounted to a total of $75 but the increase in yield had a value of $175 leaving a net profit of $100 per acre. And, of course, there was a residual carry-over of at least half of the minerals applied and perhaps 25% of the nitrogen.

1. Topdress new seedings of alfalfa and clover or old established fields of alfalfa in early fall in the manner previously indicated. The resulting increased vigor often prevents winterkilling.

2. Fertilize fall-seeded wheat or rye at the time of seeding, (nitrogen topdressing should be delayed till late fall).

3. Lime and fertilize permanent pastures being renovated in the fall at the time the land is being worked up.

4. Pasture not being renovated may be topdressed with phosphate-potash mixtures at any time. Fall application of straight nitrogen fertilizer or 10-10-10 should be limited to non-sandy soils and withheld until late fall.

5. Apply fertilizer such as 0-10-30 in the fall to fall-plowed fields which are to be seeded to small grain and legumes the following spring.

6. On heavy land being fall plowed for corn, apply solid nitrogen, 10-10-10, or other fertilizer prior to plowing. Anhydrous ammonia may be "knifed" into pasture sod or fall-plowed fields when temperature of soil drops to 50° or lower. Confine fall application of "nitrogen" to silt or clay loam soils.

Fertilizing for Better Apples

(*From page* 19)

Potassium

A deficiency of potassium has plagued Vermont apple growers for many years. Such symptoms as scorched leaves and thin, weak terminal growth have been frequently noted. Occasionally we have observed the symptom of poor fruit color. Normally, Vermont McIntosh assume a beautiful bright red color by harvest time. In some seasons, but more particularly in certain orchards in the State, fruit color has been a problem. We have suspected that low potassium was a factor but up to now we have no clear-cut evidence. Some recent research at the Massachusetts Experiment Station does show that high potassium content in the leaves tends to promote high fruit color.

Other Elements

We believe that most Vermont apple growers are now aware that they must make regular applications of dolomitic lime (calcium, magnesium), potassium, and boron as well as nitrogen to their orchards if they wish to avoid deficiencies. They no longer think in terms of nitrogen alone, but recognize the fact that as they encourage the trees to make more growth and set larger crops of fruit, they must provide an ample supply of all the elements needed for growth and development.

Because of the uncertainty of the length of time required to correct symptoms of magnesium deficiency by soil application once the symptoms have been observed many of our growers have continued to include Epsom salts in their regular spray programs even though soil applications of dolomitic limestone have been made. Perhaps when we are in a position to make greater use of foliar diagnoses and know more about the factors influencing the availability and absorption of the nutrient elements we will be able to render greater service to growers.

Boron-deficiency symptoms in Vermont orchards have been practically eliminated by applying boron to the soil every third year. Borax is the material most commonly used and the rates of application per tree vary with age from 4 ounces on young trees to 16 ounces on mature trees.

As mentioned before, deficiencies of other elements such as iron, manganese, and zinc have not been noted in Ver-

mont. We need to know nevertheless if our present fertilizer program (Table I) to encourage maximum sod growth supplemented by mulch will provide the tree with all the other so-called minor elements.

The program outlined in Table I is merely a suggestion. It will need to be varied from orchard to orchard. We believe there is merit in encouraging all growers to apply dolomitic limestone or boron, for example, in the same year. It certainly makes it easier for the dealers to anticipate the demand and provide for it. I hope that growers will use the figures in the Table as a guide only to compare with their present programs.

Mulching

Most Vermont apple orchards are grown under the sod system of culture, sometimes referred to as sod-mulch culture. The amount of mulch applied in addition to that grown in the orchard is negligible except in the establishment of new plantings. The rough terrain frequently does not permit clean cultivation during the formative years, and growers have attempted to eliminate grass and weed competition with mulches. Where mulch has been applied, the results have been good provided it has been adequately maintained. Where shavings or sawdust have been used, they too have been satisfactory provided the additional nitrogen requirements have been met. Even on mature trees we have not experienced the excessive drop reported by Massachusetts workers (5). We have often wondered, since we have had some experience with magnesium deficiency causing preharvest drop, whether the extra potassium liberated (6) under the mulch might not have aggravated an incipient magnesium-deficiency condition.

Summary

When planning a fertilizer program for their orchards, growers need to

TABLE I.—SUGGESTED FERTILIZER ROTATION PROGRAM FOR VERMONT APPLE GROWERS*

Materials	*Amount*	*Remarks*
	First Year	
Magnesium limestone	1–1½ ton/A.	Broadcast where magnesium deficiency has been observed.
Epsom salts	15# /100 gal. spray	
Borax	4–16 oz./tree	12–18" ring just inside drip line.
Nitrogen:		
Ammonium nitrate (NH_4NO_3)	1# /tree	Ring application.
or		
Urea	1# /tree	3–4 sprays @ 5# /100 gal. Begin with pre-pink spray.
or		
Mulch	400–500# /tree	
	Second Year	
Complete fertilizer (N–P–K)		
10–10–10	800–1,000# /A.	Less *if* in ring.
5–10–10	800–1,000# /A.	+NH_4NO_3 or 2 Urea sprays.
0–20–20	600– 800# /A.	+NH_4NO_3 or 4–5 Urea sprays.
	Third Year	
Nitrogen only or alone		
NH_4NO_3	Same amounts per tree as for first year.	
Urea		
Mulch		

* The suggested fertilizer program for the 4th, 5th, and 6th years would be a repetition of the 1st, 2nd, and 3rd years respectively.

consider environmental factors, cultural practices, and variety along with commercial fertilizers. Fertilizers are only one of the many factors involved in the growth responses of apple trees. As more nitrogen, the regulator of plant growth, is applied, the greater is the need for all the other constituents.

Growers cannot afford to wait for symptoms of deficiency before applying nutrient elements. They must constantly be on the alert to avoid deficiencies. Soil and leaf analyses as well as indicator plants may be used as guides in determining the need.

By using foliar sprays of urea, the grower retains a greater degree of control over growth responses and enhances fruit set, fruit bud initiation, fruit size, fruit color, and annual bearing. The good orchard manager thinks in terms of a complete fertilizer program—or better—a balanced fertilizer program, rather than in terms of nitrogen only.

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LAS VEGAS—Hydrophonics Headquarters

(*From page* 22)

lary action of the porous cinder where it is available for plant use.

Never ending in his search to provide plant requirements in the right amount at the right time, Todd is kept continually on the alert. He learned, for example, that during cool weather of fall and winter the amount of phosphorus can be reduced in proportion to the other main plant nutrients of nitrogen and potash. He also found that the solution on the acid side in reaction, from about 6.0 to 6.8, is about the optimum range in pH for his hydroponics production.

Ill effects of alkaline reaction of the solution are explained by M. R. Miller, former Research Chemist of the University of Nevada Experiment Station. Miller reported that an acid pH will keep iron in solution, but when the pH goes above 7.0 the iron tends to precipitate out. Among other things this causes chlorosis or yellowing of leaves due to lack of chlorophyll, and growth materially slows down. Control of pH, he continues, is best done by the type of nitrogen fertilizer used. Thus ammonium sulfate will keep the pH down, while potassium nitrate allows the pH to rise. In the case of the ammonium sulfate, $(NH_4)_2\ SO_4$, the NH_4 is consumed by the plants, leaving the SO_4 to form sulfuric acid, H_2SO_4, and bring down the pH. When, on the other hand, potassium nitrate, KNO_3, is used the plants remove the NO_3 leaving the K in excess to form potassium hydroxide, KOH, which makes the solution alkaline.

Twice each week the solution is tested by a Las Vegas chemist who determines how much of the different plant nutrients should be added to

bring it up to standard strength. Careful weights and measures are needed not only to keep the solution uniform during any given period but to change it gradually to meet the needs of plants as their growth developments change.

Pollination of the tomato flowers is accomplished by hand every other morning by either Mr. or Mrs. Todd. Using a small brush to whisk each flower, the pollen is transferred from the anthers to the pistil. Another method they have tried is "thumping" or the jarring of each flower by thumping it with the index finger. They are now considering getting a hive of bees and letting them do the pollinating.

"Freedom of insects and diseases, no weeds to hoe, no cultivation to take up time, and pushbutton irrigation," Todd says, "really make hydroponics the modern way to raise vegetables for the premium market; and Las Vegas provides that market."

Remembered Roads

(*From page* 5)

was returned to them from their childhood of close acquaintance with and deep appreciation of the constant life and beauty along that pleasant rural road. They never had to visit museums and plant collections to learn this treasured lesson of the wild.

It was in just such a somnolent and quietly striking country during the era of the frontier that a certain studious farm youth became enamored with the vast world of knowledge lying in the lap of nature around him, ready to be plucked and admired and classified. Bereft of any desire to be narrow and local in his search for the truth, and choosing rather to be a student of rocks and plants and waterways than to be a farm producer of plants and animals, he went on to a notable career of international significance. Today the discoveries and factual treasuries of nature that John Muir of Wisconsin gave us are those that first sprang

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from his lonely rambles along a road or two in his township.

Speaking of childhood visions of well-trodden roads, a girl whom I knew for a long time often remarked about such a rural thoroughfare that wound down past a big white farm house near a popular crossroads store and blacksmith shop. It was at this comfortable home of the nineties that six children played through many summers, when not on duty in the fields or kitchens. She had a treasured memory of several vacation days spent with her cousins at this placid estate. Wildflower gathering, country dances in a green pavilion, bareback rides on weary farm horses down the dusty road, and picnics in the schoolhouse park were uppermost. The two outstanding recollections were the times when the kids all sat up in the haymow door and watched and waited for the sight of a noble troop of U. S. artillery on the march, and later, the rumor that a horseless carriage had left the courthouse town 20 miles distant and would chug its way past their vantage point, if all went well with its mysterious mechanism. She had a slightly superior air that day, because a year before she herself had seen a motor car in the city of Milwaukee. Yet her smug complacency distracted nothing from the expectancy and eagerness of her country cousins—who little knew that as men soon grown they would be doing their farm work with similar snorting gas buggies.

IN the matter of expectancy, I know a road that in my own youth carried all the garish and unusual associations that arouse and hold the fixed attention of small boys—and often big ones, too. It was a sort of stub or spur road that left our highway just south of town, to meander over into the meadow enclosure used as a baseball park, a circus grounds, and the county fair acreage. On exciting occasions when something was doing there, we trudged down past the willows along the marsh, and then over the rise from whence we could see the fluttering banners and the white tent tops in the sun. And making it doubly irresistible, we could hear the lilting cadences of a uniformed brass band. For in those days music of a secular order was a luxury, something only possessed by families who owned parlor organs, pianos, flutes, or cylinder gramophones. Although we always hurried barefooted along that sandy stretch, I remember some of its features yet. Each notable tree and shady bower proved a sort of milestone leading us into the anteroom of raucous and corny entertainment—the only public kind we had in that era of gypsies, traveling mountebanks, and menageries coming and going on the dust and mud of unimproved roads.

SUCH brief fun as we had was pardonable because we were living where sorrow was public property. Our homestead stood on a gravel road which had a parallel footpath beside it, both leading to Silver Lake cemetery a few rods distant. Tall poplars lined the passageway, and thick growths of elderberries edged the path. Purple hills in the southwest, sunset in our faces, reluctance in our limbs, as we joined groups bound for the burial place.

On Sundays people came laden with flowers from their backyard gardens. Some who had no gardens of their own stopped in the fields to gather bouncing bets, violets, coneflower daisies, liverwort, and toadflax with which they filled containers for their family graves. Stragglers often stopped at our well for refreshment, and then we heard how empty life can be without the cheer, respect, and confidence of someone missed and mourned.

Yet to us who were its near neighbors, the burying ground had no dread or melancholy. For in the cemetery on sunny days the birds sang and built their nests, the sunlight invaded deep green pockets in the mournful pines,

the clouds above formed dazzling snowy castles and peaks of paradise, the river gleamed along the valley below, and little children played tag among the tombs.

When I see wild grapevines clambering over old oaks beside a running brook, I seem once more to be dawdling along on the road to school, loath to enter the stuffy classroom when so much that was attractive grew in wild profusion everywhere. But we had a teacher who shared our preference for the real world beyond the bookshelf. She had collected a few of those junior leaflets on natural history issued by Cornell. These she distributed and used as simple texts on plant habits and differences, identification, and uses, if any. Shapes of leaves, numbers of petals, type of blossom, family classifications, and manner of seed formation and distribution were covered in a loose way that stimulated further desire to investigate and learn. Most of our assignments were fulfilled as we walked to and fro along that backwoods lane. Had we been carried by bus or auto on a set time schedule, there would have been little chance for daily roadside study.

OF course, all roads must lead somewhere. That is their main purpose in being there. But while we are on our way, while we set out to meet old friends or complete some routine duty, is there any reason why the objects of nature's skill and the landmarks of man's progress should be overlooked in disdain?

Hence it is just as true that roads lead *past something*. Even the modern advertisers know that too well, often to our real loss done in large letters on roadside rocks. If we can stay the hand of the despoiler and help folks to preserve intrinsic values given so abundantly to certain favored localities, maybe we can regain some of that which is lost.

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The Plant Speaks Thru Leaf Analysis
Borax From Desert to Farm
Potash Production in America

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.

Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.

Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.

Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.

West: Department of Visual Education, University of California, Berkeley 4, California.

Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.

Department of Visual Instruction, Oregon State College, Corvallis, Oregon.

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For the Province of Ontario: Distribution Services, Ontario Agricultural College, Guelph, Ontario.

IMPORTANT

Requests should be made well in advance and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

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The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

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S-5-40 What is the Matter with Your Soil?
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
A-1-44 What's in That Fertilizer Bag?
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—The Aristocrat
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
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X-8-51 Orchard Fertilization Ground and Foliage
BB-10-51 Healthy Plants Must Be Well Nourished
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J-3-53 Balanced Nutrition Improves Winter Wheat Root Survival
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JJ-11-53 Boron—Important to Crops
MM-12-53 White Birch Helps Restore Potash-Deficient Forest Soils
K-2-54 Soil and Plant Analyses Increase Fertilizer Efficiency
R-3-54 Soil Fertility (Basis for High Crop Production)
U-4-54 Nutrient Balance Affects Corn Yield and Stalk Strength
BB-6-54 Potash Pays on Forage in New England
CC-6-54 Fertility Increases Efficiency of Soil Moisture
EE-8-54 Red Apples Require Balanced Nutrition
FF-8-54 Apply Fertilizers in Fall For Old Alfalfa, Grass Pasture and Timothy-Brome Fields
GG-8-54 Effect of Boron on Beets and Crops Which Follow
JJ-10-54 Principles Involved in Soil Testing
LL-10-54 Relation of Fertilizer to Quality and Yield of Flue-cured Tobacco
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VV-12-54 Potassium Affects Growth of Stocks
YY-12-54 Physical Condition of the Soil Affects Fertilizer Utilization
A-1-55 Potash-Deficiency Symptoms
B-1-55 The Net Worth of Soils in the Northeast
C-1-55 Summary of Ten Years' Work with Complete Fertilizers on Sugar Cane
D-1-55 Nitrogen Use Accentuates Need for Minerals
E-1-55 Guides to the Management of Illinois Soils
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A man was accustomed to walking through a rural cemetery on his way home, since it was a short cut. One night he started through, unaware that a new grave seven feet deep, had been dug in his path. He stumbled into the grave.

He struggled for almost an hour trying to climb out and then finally gave up, deciding to sit in a corner until morning, when he hoped someone could hear his cries. He settled down for the night.

A gangly farmer out on a 'possum hunt also started through the cemetery, and he, too, fell into the grave. He began a desperate struggle to get out, unaware anyone else was in the grave with him.

The first man listened to him silently for a few minutes and then reached over in the pitch-black dark and laid a hand on his shoulder.. "You can't get out of here," he said.

But he did.

* * *

A woman applying for renewal of her driver's license was amused when a special clerk who was interrogating her slightly changed one of the questions, asking: "Have you ever been adjudged insane or feebleminded—that is, by anyone other than your own children?"

* * *

Little Mary: "Mother, they are going to teach us domestic silence at school now."

Mother: "You mean domestic science, don't you?"

Father: "There is a bare hope our little girl means what she is saying."

* * *

A radio listening-preference survey required that the answers had to come from male heads of households. The survey got off to a fast start, but then was called off abruptly. Answering the question, "To whom are you listening now?" the first 78 men replied, "My wife."

* * *

An old bachelor surprised his friends and married. A few months later the bridegroom was visiting among his former companions when one of them asked: "John, tell us about this marryin' business. Jes' what kind of a match did you make?"

"Well," John replied, "I didn't do as well as I expected." He paused and thought a moment. "And to tell you the truth, I don't think she did, either."

* * *

A man is never so weak as when a pretty girl is telling him how strong he is.

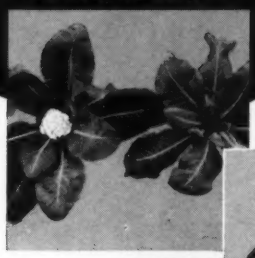
* * *

The absolute end of old maid jokes is marked by the following:

Two spinsters sat on a porch knitting when a hen came tearing around the corner, with a rooster not too far behind. Around and around they whirled. Finally, the hen, still doing well over the speed limit, ran into the path of a passing car. Observed one of the female spectators, "See, she'd rather die!"

Alfalfa yellows and rosetting due to boron deficiency

Cauliflower: left, boron treated; right, brown curd with boron deficiency



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Apples with external cork cracks, necrotic areas and dwarfed

Tobacco with die-back of terminal bud rolling of upper leaves

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